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Index to Advertisers—See page xl.

Principal Contents:

	PAGE
Heating Large Buildings	813
The Radiological Exhibition. By C. Morgan Davies	815
Two-part Prepayment Meters. By "Avec"	818
Fractional H.P. Motors. By S. F. Philpott	819
Domestic Electrification in Cape Town	820
Low Temperature Space Heating	821
Meetings and Discussions	823
Correspondence: Better Demonstrators; Fog Lights; Liability for Consumer's Apparatus; The E.D.A. Films; Earth Leakage Protection; Commutator Mica; "The Battle of the Systems"; Electrical Accidents; Wanted—A New Unit; Lift Control	826
New Apparatus and Devices	830
Marketing Electric Vehicles. By J. F. Amor	831
Parliamentary News	832
Business and Industrial Notes	833
Electricity Supply	837
Traction	840
Communications	840
Contract Information	841
Notes	842
Our Personal Column	843
New Companies	844
Returns of Electrical Companies	844
City Notes	845
Published Specifications	847
New Work for Contractors	848

Heating Large Buildings.

THE use of electricity for space heating is still in the stage at which the "why" of the problem is more difficult of solution than the "how." That is to say, we are more able to make a correct choice of systems and of methods of installation than we are to convince owners of buildings that they should (superficially regarding the question as one of the number of B.th.u. provided for a given expenditure) use electricity for the purpose at all.

The difficulty is increased when hot-water systems, which are especially suitable for the general heating of large buildings, are under consideration, as many of the more obvious points in favour of electricity, such as the advantages of luminous, radiant heat and its local adaptation, are eliminated.

We hoped that more would have been heard about the means of equating higher B.th.u. costs with the cash value of savings in other ways during the discussion on the I.E.E. paper of Messrs. R. Grierson and D. Betts (which did not profess to deal with this aspect except incidentally). This discussion was somewhat disappointing, perhaps because some of those taking part were allowed too long an innings, which prevented the expression of a sufficient variety of opinions on a subject on which opinions are known to differ.

In addition, the atmosphere of the lecture hall on a warm evening was not conducive to liveliness in debate, and Mr. Grierson might have added to his implication that the Institution's heating system was not a fit subject for illustration by a reference to the negative proof it provided of the value of automatic control. We hope that when the Institution gets its new building it will have air-conditioning and warming plant more in accord with the ideal.

While the authors did not aim at dealing in any detail with the "why" of electric heating, they did—in addition to presenting a large amount of valuable and comprehensive data on how to do it—give some useful notes on securing the load. Thus they referred to a method of charging in which energy for all purposes is supplied at the same rate as the off-peak heating—a form of inducement tariff that was, we believe, first used at Hull, and described by Mr. J. N. Waite in our issue of June 1st.

Another method is on a lump sum per annum basis (subject to coal clause), which Mr. C. H. Smyth has introduced for public baths in St. Marylebone, but which should be capable of extension to buildings with guarantees of minimum temperatures, as is being done by gas companies.

There is enough evidence now that upwards of 100 per cent. increase in cost above that of coke on a B.th.u. basis (making 0.2d. per kWh, to include 0.05d. for elimination of attendance and 0.05d. for amenity and other values) is justifiable and can be justified in far more cases than is often apparent. This depends to a great extent on clear understanding on the part of supply undertakings of what is being done by coke and oil—upon the strength and weakness of our principal competitors.

Our Film Propaganda

THERE is plenty of criticism of the E.D.A. propaganda films, and some of it is justifiable, but we hope that this will not deter electricity supply authorities from giving them a fair chance of proving their suitability among the millions of non-users of electricity for whose instruction and edification they have been prepared. We have been present at several demonstrations before electrical audiences, and can understand the difficulty experienced by some critics in forgetting that the films were not intended to teach electrical men anything. Their object, as we indicated in our issue of November 30th (p. 742), is to appeal to very ordinary people in widely differing localities who we may hope will become electrically minded because things are put before them in a new and more or less attractive way. It is perfectly true that in making a beginning electrically with this new kind of publicity those who have introduced and prepared the films have been engaged upon an experiment; later productions, if and when there are any, will

probably profit from present criticism and experience. But the money has been spent; improvements have been made; and the organisation is running. The only reasonable thing to do, therefore, is to display the films wherever possible and do our best to make them successful, observing the results in a hundred different localities among all classes of the community.

Seven Years

MR. FRANK PARKINSON was able to look back with great satisfaction upon seven years of continuous extension of activities in many directions when he addressed Crompton-Parkinson shareholders last Friday, for during that period the total business was more than trebled; and expansion still continues. Specialisation in various lines for large-scale and efficient production and the addition of new manufactures has been the policy followed, and it has maintained a "reasonably satisfactory profit-earning capacity" in spite of intense industrial depression. Trading conditions improved during the year, but overseas operations were, of course, still affected adversely by world conditions. His study of the general indications led Mr. Parkinson to the view that the current year's trade would not be less favourable than the last, but in the present unstable political conditions of the world who could take a reliable long-distance view?

Better Illumination

A TOPIC of very general interest to the lamp-making, electricity supply and contracting sections of the industry was mentioned by Mr. Parkinson, namely, the growing public consciousness of the need for and the beauty of light. After much waiting there is really substantial progress being made at last, and the growth of better lighting and more beautiful illumination is increasing because stores, public buildings, tradesmen, and so on are following each other's example. From the electrical industry's point of view it is all to the good that we are getting beyond the reverence-for-darkness habit. Floodlighting and neon lighting, as well as other electrical forms of illumination, are revealing by night the grace and beauty of many a fine edifice, and one result is a demand for other buildings to be similarly dealt with. Yet what has been accomplished so far but serves to emphasise how much remains to be done. Who will shoulder the work of preparing a schedule of the black spots in London and other cities and use influence to effect a change?

Light as Decoration

MERELY to satisfy utilitarian needs does not take us very far on the road of progress. The greatest developments follow the later discovery of methods of application that make an appeal to other faculties. Thus the future of illumination is not only a matter of connecting up all residences and bringing the lighting installations in factories up to an economic value. That is indeed something to strive for (and we still have a long way to go), but we shall not have exploited the possibilities of the lighting load until we have demonstrated its scope in decorative illumination, which is only indirectly related to foot-candles on the working plane. The potentialities of a most promising form of decorative lighting may be gauged from the illustrations in a booklet just issued by the E.L.M.A. Lighting Service Bureau entitled "Architectural Lamps," which also gives particulars of their leading characteristics. An important point in favour of decorative illumination is that it tends to give an appreciably higher load factor.

The Professional Code

THE views of experienced Government officials as to the value of the independent consulting engineer were made quite clear by Sir Cyril Hurcomb and Mr. I. G. Gibbon at the dinner of the Association of Consulting Engineers. Sir Cyril is convinced that their engagement is to be regarded as an essential part of sound administration, and Mr. Gibbon has come across numerous cases of losses incurred due to lack of disinterested technical advice. Many public bodies do not adequately realise that it is no reflection on the intensive knowledge of local conditions possessed by their permanent staffs if this is supplemented by experience that is more extensive and varied. The "Notes upon Professional Duties" recently issued by the Association not only indicate what may be regarded as a "bulwark of decency," to quote Sir Alexander Gibb, but also enable local authorities to know definitely what are the responsibilities undertaken by the consultants they retain.

X-Ray Progress

THE Radiological Exhibition, which is reviewed in this issue, is a friendly and pleasant affair, as much a family gathering and reunion of fellow-workers as a business meeting. The manufacturers are to be congratulated on their efforts and upon the progress that is being made. A wide range of equipment is now available to suit practically every need, and the proper selection is one of the greatest problems of the buyer. One often hears users complain that their apparatus becomes old-fashioned and obsolete too quickly. Now that ray-proofing and shock-proofing appear to have reached a fairly stabilised condition there should not be so much risk of premature obsolescence from this quarter as hitherto. The march of progress continues without interruption, and we all have to pay the price. Future advances will probably be concerned with the development of tubes, photographic accessories and control devices, especially time switches and the like. If this view is accepted it would appear that careful consideration of the best type of h.v. unit to meet these developments is the most important point.

An Industrial Centenary

CENTENARIES of electrical manufacturing companies are a luxury that we must leave to the rising generation. There are amongst us now, it is true, some well-known firms prominently engaged in electrical production work who were in existence one hundred years ago, but they were then occupied in making things which could hardly be called strictly electrical. Some of the early cable-manufacturing companies and fittings producers have a very lengthy record to their credit, and others have been producing instruments, switches and other things for over half a century. To Messrs. Pinchin, Johnson & Company, however, of whose very prominent place in association with the industry everybody electrical knows, belongs the distinction of having been founded in the year 1834. It has been engaged in business "Through Four Reigns," as the cover of its centenary celebration publication tells us, and its progress is linked with the rise and growth of industrialism. A century of changing conditions and new inventions has made varying demands upon succeeding generations, and those responsible for the conduct of this business have not failed to adapt themselves, and the specialised insulation and varnish knowledge and facilities at their command, to the needs of the electrical industry, but have kept well abreast of its requirements.

An Economic Virtue

THAT cleanliness in lighting methods has an economic value is nowadays readily granted, but the amount that should be credited to electricity on this account is not generally appreciated. From data collected by the E.L.M.A. Lighting Service Bureau it would appear that the ascertained cost of lighting by gas should be increased by 15 per cent. to make it comparable with the cost of electricity. Looking at it in another way, claims for candle-power per therm advanced by the gas authorities should be reduced by 10 per cent. to give overall costs equivalent to those obtainable with the use of electricity. The avoidance of expenditure on one ceiling decoration due to a change-over from gas may be enough to pay for the electrical installation, apart from the permanent value of the latter to the residents.

The Radiological Exhibition. By C. Morgan Davies, A.M.I.E.E.

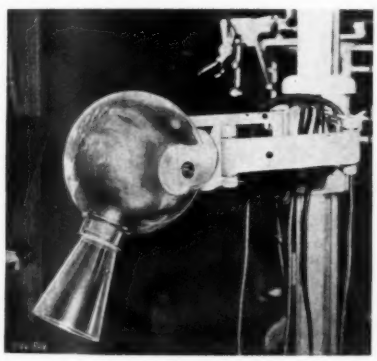
Many improvements and new developments

AFTER the praiseworthy display at the Central Hall last year, one went to last week's exhibition of X-ray apparatus expecting to find improvements in detailed design, finish, and protective devices, rather than startling developments.

In addition to progress in these directions, however, I found that several novel and interesting pieces of small apparatus were displayed for the first time and evoked much interest. Apparatus built on the unit system, in which a small-power self-rectifying X-ray unit is incorporated with each piece of examination apparatus, was not so much in evidence this year as last.

It is interesting to note the disappearance of the wooden cabinet as a housing for the larger h.v. unit. Sets are now built either for housing in a separate machine room, fitting in all-metal cabinets with finishes to harmonise with the room decoration, or enclosed in cages of expanded metal. Where the transforming unit has to be installed in the operating room the cage enclosure does not appear to be the ideal arrangement, considering the difficulties of cleaning and the high standard of hygiene which it is essential should be maintained.

No three-phase units were shown. This is probably due to the bulk and cost of such equipment and the present limited demand. Now that efficient rotating anode X-ray tubes having small focal areas and capable of withstanding high energy inputs are available, it will be interesting to observe tendencies in this direction. An alternative to three-phase plant may be found in equipments having outputs of 300 to 400 mA at 80 kVp for general work, with an alternative condenser discharge circuit for producing high-speed radiographs of moving organs. Particulars of a plant of this type were available on the stand of the Victor X-Ray Corporation, Ltd.

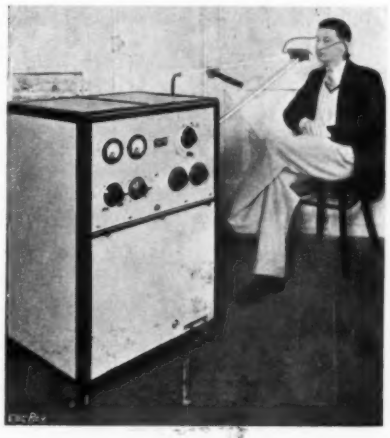


The Siemens X-ray sphere

Most h.v. units are now fitted with fairly reliable time switches for controlling exposures from 0.05 sec. up to several seconds. Timers are also obtainable which will control exposures down to one impulse (half-cycle). Below this value problems concerned with lag and the inertia of moving parts become troublesome. The information which was obtained upon the stand of the General Radiological & Surgical Apparatus Co., Ltd., concerning the development of secondary circuit switching, in which a grid-controlled gas-discharge valve is caused to act as a "current gate," opens up many possibilities; the development will be awaited with much interest.

There is a definite demand for a tilting examination couch suitable for universal application, and several exhibitors displayed equipment of this type, mostly motor driven. Generally, the electrical and mechanical arrangements of these couches are sound and the finishes excellent. Apparatus for therapy was not so much in evidence, the main exhibits of this type being on the stands of Messrs. Newton & Wright, Ltd., and G.R.S.A., Ltd. There is, however, no slackening of activities in this field, rather the opposite, and all the manufacturers are producing equipment suitable for therapeutic purposes.

The demand for a small unit for consulting room, portable, and dental work, is well catered for. These units are suitable for fluorescopic and radiographic examinations and have outputs of the order of 7 to 10 mA at about 50 to 70 kVp. The Victor X-ray Corporation's model "F" appears to be a modification of the well-known "CDX" unit. It is ingeniously designed to work in any position, is of small dimensions, and very compact. The Siemens X-ray sphere (illustrated) is housed in a container about the size and shape of a football. Both these units are of the oil-immersed type. Philips Lamps, Ltd., have introduced two miniature models known as the "Centralix," designed primarily for dental work. This design employs a "hedgehog" type transformer with dry insulation. A somewhat larger unit having an output of 14 mA at 64 kVp was exhibited by Messrs. F. R. Butt & Co.

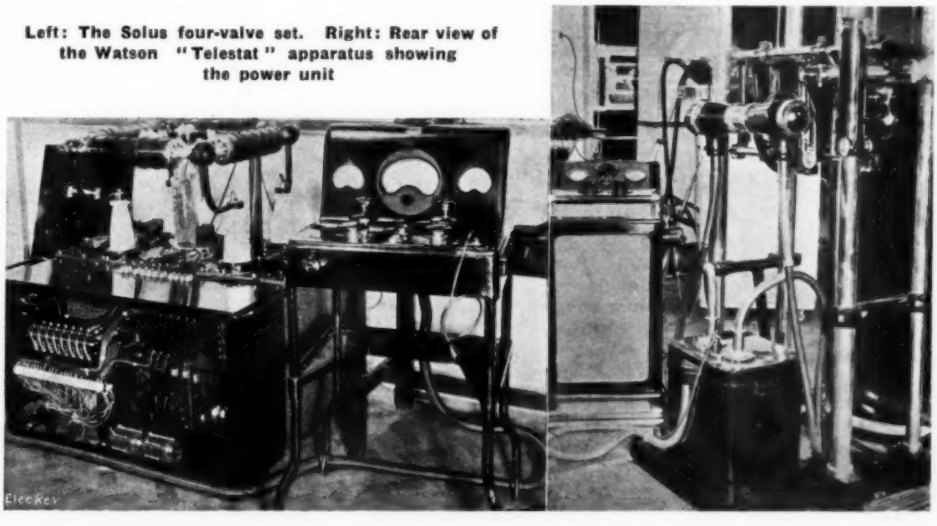


A Marconi ultra-high-frequency therapy set

The introduction of the 50/60-mA 90-kV self-rectifying X-ray set has greatly increased the usefulness of this type of unit. Messrs. Watson & Sons (Electro-Medical), Ltd., exhibited a good example of this range of equipment in conjunction with their "Telestat" examination apparatus. The component parts of the equipment are carefully matched to give maximum useful X-ray output, the tube being of the restricted cathode type. Units coming within the 30/60-mA 90-kV range are favoured for mobile work in hospital wards. Representative equipments of this type were shown by Messrs. Schall & Son, Ltd., Messrs. Stanley Cox, Ltd., and Messrs. Newton & Wright. The last-mentioned firm has introduced an improved form of vertical pillar to support the X-ray tube. This is shorter than the usual design and incorporates a winch, enabling the tube carrier to traverse the maximum length of the upright.

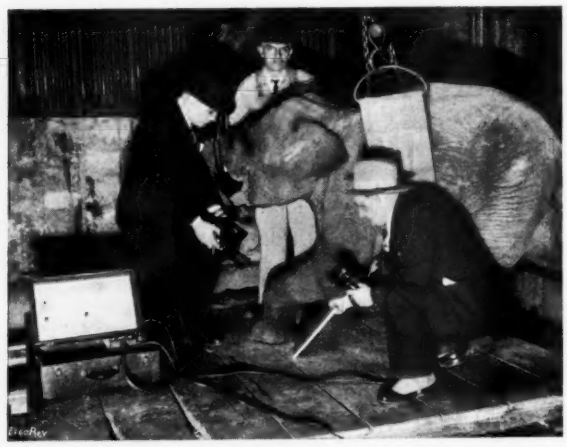
H.v. units employing half- or full-wave rectification and having outputs of 200/400 mA up to 100 kVp find a wide field of application for diagnostic purposes. These are frequently installed to serve two or three pieces of examination apparatus through the medium of a h.v. selector switch of the dry or oil-immersed type. The combination unit employing a self-rectifying or single-valve circuit for diagnostic purposes with switching arrangements to incorporate a condenser discharge circuit for therapy seems to be dying out. This type of apparatus was not shown this year. Developments now taking place

Left: The Solus four-valve set. Right: Rear view of the Watson "Telestat" apparatus showing the power unit



indicate that X-ray diagnostic departments and treatment departments of the future will be quite separate.

Oil immersion of the rectifying valves has been introduced in the Siemens twin-valve "Heliodor" apparatus, exhibited for the first time by G.R.S.A., Ltd. This unit employs half-wave rectification and is rated at 200 mA at 80 kVp. The secondary winding is divided at the centre, a valve being connected between each inner end and earth; the connections for the milliammeter, which is fitted on the control table, being taken from between the two valves. The latter are oil immersed in two "Pertinax" containers, fitted with small inspection windows and suspended in the transformer tank by flanged ends. This circuit arrangement provides a symmetrical distribution of pressure, and keeps the charging current off the h.v. cables during the unwanted half-cycle, thus allowing greater lengths than hitherto permissible with this type of apparatus. The h.v. unit is completely shockproof; the dimensions are 2 ft. 3 in. square.



The Victor X-Ray Corporation's miniature unit at work on a tough job

The Solus Electrical Co. displayed a new model full-wave rectified h.v. unit (illustrated) designed for use with stationary or rotating anode tubes and incorporating Philips gasfilled e.h.v. rectifying valves. The controls incorporate a combination of primary tap and auto-transformer selectors, designed to reduce voltage drop at the full output to the minimum. Suitable devices are provided to prevent excitation of a rotating anode tube unless the rotor is running. The Solus Co. also exhibited a new model motor-driven tilting couch and a therapy tube stand.

Messrs. A. E. Dean & Co., Ltd., exhibited a range of improved equipment, including a 200-mA 100-kVp four-valve apparatus of recent design. This unit may be arranged to operate from a three-phase supply by utilising a Scott-connected auxiliary transformer. The rectifying valves are of the opaque glass type and a compensating transformer is fitted to ensure constancy of filament current irrespective of the h.v. transformer loading. Messrs. Schall & Son, Ltd., exhibited a similar apparatus rated at 450 mA 50 kVp and suitable for remote dual control of current and pressure. This enables the actual handling of the unit to be carried out from the side of the patient. The most interesting exhibit on Messrs. Schall's stand was an oil-immersed copper-oxide rectifier of the half-wave type designed for 30 mA at 200 kVp. Two of these units are required to rectify for a therapy circuit employing reservoir condensers, and this development will be followed with much interest.

New Tubes

Important additions under this heading are the "Pantix" rotating anode tube shown by G.R.S.A., Ltd., and the Victor X-ray Corporation's double focus shockproof Coolidge tubes. The "Pantix" is an insert tube designed to fit the Siemens "Tuto" shockproof shield and consists of a glass bulb fitted with an off-centre line focus cathode and a solid tungsten anode. The latter is mounted in ball bearings and arranged for rotation under the influence of a split-phase stator winding housed in the shockproof shield. Two models are available, rated at 20 and 40 kW respectively. Chest films taken with these tubes were exhibited and evoked favourable comment on account of sharp heart outline and wealth of detail.

The new Coolidge shockproof tubes shown by the Victor X-Ray Corporation are available in two double focus sizes, rated at 2 and 8 kW, and 4 and 12 kW, respectively. The insert tubes incorporate the Benson line focus and are housed in new model shockproof shields. The latter are oil filled, fitted with expansion chambers, connection to the h.v. system being made by means of varnished cambric and impregnated earth shielded cables. The small proportions and neat appearance of these tubes were much admired. Mr. Cuthbert Andrews displayed the well-known range of "Protexray" tubes, together with a new model shockproof shield. This is designed to take standard insert tubes and is fitted with a built-in fan at one end for cooling purposes. An interesting and useful accessory device seen on this stand consisted of a "centre ray finder," an adaptor for attachment to the X-ray tube or shield to aid accurate centring of the beam upon the area to be radiographed. After centring the telescopic pointer is moved clear, to a position parallel to the axis of the tube.

Industrial users are now catered for by the "Metalix Micro" apparatus, shown on the stand of Philips Lamps, Ltd. This equipment is very compact and complete in detail and is designed for the X-ray examination of the crystalline structure of materials, in connection with general industrial problems. It consists of a metal casing which houses the h.v. unit and the ancillary cooling apparatus and also incorporates the necessary cameras and tube. The latter is attached to the top of the apparatus in such a manner that it may easily be exchanged.

Diathermy

Development of short wave diathermy apparatus is progressing at a steady rate. Equipments of this type were shown by Messrs. Watson & Sons, Ltd., Messrs. Stanley Cox, Ltd., G.R.S.A., Ltd., and Marconi's Wireless Telegraph Co., Ltd. The latter organisation displayed a valve-operated ultra-h.f. therapy unit (illustrated) specially designed for bacteriological research work. The circuit of this machine incorporates a split anode magnetron valve, the output at the specimen or patient's electrodes being 150 W. The frequency is infinitely variable between 35, 300 kc. and 115, 380 kc. per second (8.5 to 2.6 metres) and may be read by means of a detachable direct-reading frequency meter. Models suitable for surgical work, in which field the h.f. spark cutter finds many applications, were shown by Messrs. Marconi, Newton & Wright, and Schall & Son.

In the field of cardiology there is the new Standard-Cox electrocardiograph, shown on the stand of Messrs. Stanley Cox Ltd. This apparatus, designed for producing a visual and also a permanent photographic reproduction of the wave form of the heart beats, employs a cathode-ray oscillograph. The tube incorporates a fluorescent screen having considerable after-glow, thus retaining the wave form for a sufficient period of time for the examiner to make a visual inspection. Successive beats can be retraced as desired and a permanent photographic record afterwards taken. The apparatus is of clean design and housed in a metal cabinet mounted on castors, thus making the examination of patients in bed much easier. The facilities for visual examination of the wave form would appear to offer decided advantages.

Other interesting exhibits were the range of mercury vapour therapeutic lamps displayed by Hanovia, Ltd., an automatic static stabiliser for steadying filament supplies during periods of mains fluctuation, and a loud-speaking telephone equipment for providing two-way communication between rooms, shown by Messrs. Watson & Sons, Ltd. A useful application of the latter equipment is to provide communication between a patient undergoing X-ray treatment and the operator, sitting in an adjacent rayproof control room.

Advice to Young Engineers

AS Research Director at the General Electric Co.'s laboratory Mr. C. C. Paterson's address at the Northampton Polytechnic Prize Distribution last Friday was awaited with great interest. It consisted of able and sound advice to young engineers, born of fifteen years' experience in interviewing applicants for positions. In the speaker's opinion a knowledge of technical German was an essential part of a technical man's education. Mr. Paterson considered that the practical quality which was of most value was a modest—not aggressive—initiative, while continuous mental stimulation was necessary for the technical man, since, after all, the high-frequency engineer did need to know what the fifty-cycle man was doing. The best way to find out was to attend the meetings of the scientific societies such as the I.E.E. and the Physical Society. It was imperative, too, he said, for the ambitious man to put himself in the way of experiences as they might not otherwise come to him, while finally there were the qualities of loyalty and personality.

Mr. S. C. Laws, the Principal, speaking of the past year's work, reported the extension of laboratory accommodation for the electrical engineering course and said that examination successes were on the high scale of previous years, while the number of students and hours of attendance showed a gratifying increase. The prize distribution was preceded by a concert by the Operatic Society, and after the event the guests toured the workshops and laboratories which were open to inspection, finishing the evening by listening to a play "The Dear Departed" given by the Dramatic Society. The conversazione was held the following evening.

Preparations for the Christmas Electrical Trade

1. At Selfridge's. 2. Good business at Beckenham. 3. The County of London Co.'s Putney showrooms. 4. The main entrance of the Beckenham showrooms. 5. A decorated interior at the Croydon Corporation's establishment. 6. A gift window at Hackney. 7. The Earl's Court Road showrooms of the Brompton & Kensington Company. 8. Interest at Hackney. 9. Messrs. Troughton & Young's, Knightsbridge

Two-part Prepayment Meters. By "Avec"

A consideration of collection methods

OF the numerous forms of two-part tariff prepayment meters the most popular appear to be (1) the mechanically operated type in which the collection of the standing charge is dependent on a function of the prepayment mechanism itself, and (2) the standing-charge collector type in which a continuously running motor is incorporated.

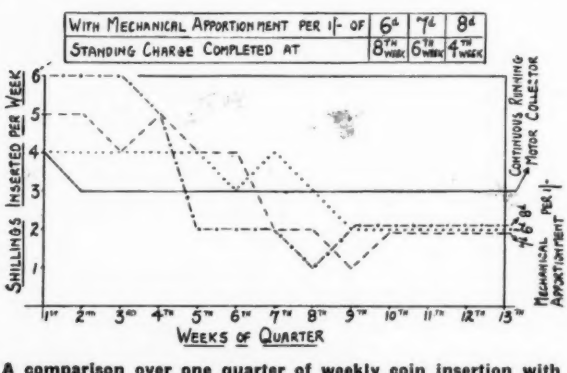
The mechanically operated type includes, as an addition to the ordinary prepayment mechanism, an apportioning differential the duty of which is to deduct immediately from the value of inserted coins a predetermined amount towards the cancellation of the standing charge, until the full amount has been collected; after that it ceases to function, so allowing the full value of the coin to be obtained in kWh.

In this way the collection of the standing charge is dependent on the rate at which electricity is taken, and also the regularity of use throughout the year. Therefore there is no need to consider its application to lighting loads only, as the very low summer consumption indicates failure to obtain the standing charge. The suggestion of increasing the winter charges to cover this, might appear satisfactory, but it causes accounting difficulties and unduly penalises the consumer at times.

Where cookers and water heaters are in use the mechanically operated type certainly deserves consideration, as the simplicity of its familiar prepayment mechanism must appeal. The amount to be apportioned which usually can be varied from 5d. to 10d. by changeable compounds in 1d. steps, must be high enough to ensure collection of the standing charges, and, more essentially, low enough to give a reasonable number of kWh per coin.

The Apportionment of Payment

Perhaps the easiest method of determining this is to obtain the average "all-in" price per kWh actually paid, *i.e.*, dividing the total estimated account by the kWh consumed. The latter figure should be based on an absolute minimum consumption for the conditions. As an example, we may take a case in which the total standing charge is 15s. per quarter (including cooker hire), the running charge ¾d. per kWh, and the estimated consumption 240 kWh. The total account amounts to 30s., and the "all-in" price works out at 1¼d. per kWh. The apportioning wheel should permit each coin



A comparison over one quarter of weekly coin insertion with mechanical and motor collectors with a standing charge of 15s. and an average consumption of 30 kWh per week. (The falls in the curves are due to accumulated units)

to allow 1s./1¼d.=8 kWh, until the standing charge has been obtained. As the prepayment mechanism is fitted with a ¾d. price-change wheel we get 1s. less 8 kWh at ¾d., *i.e.*, 6d., as the required apportioning wheel to collect 15s. standing charge in thirteen weeks. As the estimated consumption was an absolute minimum, an increase is certain, and consequently the standing charge is realised in a shorter time.

The apportioning differential is now wound up to the requisite setting, taken as 15s., this being indicated on a "rental arrears" dial, and each inserted coin sees 6d. deducted until such time as the zero position is indicated, *i.e.*, the full standing charge has been collected, after which, as the apportioning differential no longer functions, each subsequent coin gives the full 16 kWh since the meter is now an ordinary prepayment meter.

When the collector calls, the standing charge is again set on the "rental arrears" dial and collection commences from the next inserted coin. An astute consumer might fill up the "coins unused" dial (generally four) immediately prior to the collector's call, thus getting a store of "cheap units" to commence with, but this has not happened in my experience.

An average consumption where a cooker is in use is about 350 kWh per quarter, and the accompanying curves show that even with an apportionment of 6d., the standing charge is collected in eight weeks. This gives a period of five weeks to cover possibilities such as "cheap unit store" or holidays. This is probably the strong point of the mechanical collector, since there is no running into arrears.

Standing Charge Collectors

The standing-charge collector type has, as an addition to the prepayment meter, a constant speed motor permanently connected across the supply, which runs out the prepayment mechanism at such a speed that a consumer must insert not less than the predetermined standing charge. This ensures that the conditions of the two-part tariff are fulfilled, for the standing charge can be accurately and regularly collected independently of the consumption.

The Ferraris type incorporates a shaded-pole motor capable of a speed variation of from about 10 to 150 r.p.m. Reduction trains permit of common speeds between 2 and 10 r.p.m., equalling 1d. per week standing charge collection.

The ease of speed adjustment, necessitating only a stop-watch and suitable tool, make *in situ* additions or reductions comparatively simple. The modern type allows for this without removal of the cover, a strong point in its favour.

The meter can be fitted on a.c. circuits of ordinary frequencies at from 100 to 250 V. The speed of the shaded-pole motor varies with the applied voltage, the variation being 14½ per cent from 100 to 200 V, and 1½ per cent from 200 to 250 V. Only motor recalibration is necessary when a voltage is standardised.

Considerable experience has shown a small shortage in the standing charge collected after about two years' service, due to a slight slowing-up of the Ferraris motor caused by friction in the reduction train. Recalibration *in situ* is definitely a temporary remedy, but the results are unreliable; the only cure is removal of the meter for thorough overhaul. It is a big advantage to calibrate initially with about 5 per cent. addition to the standing charge, thereby lengthening the period of reliable service, for the few extra coppers collected are hardly noticeable and can be returned to the consumer.

The meter in which the standing-charge collector is a self-starting synchronous motor is extremely accurate. As the motor speed is constant, the reduction train must be varied by compounds of ratio equivalent to the standing charge, usually in ¼d. or ½d. per week steps.

A large range of these ratio compounds must be carried, and although changing is a simple matter, the cover has to be removed to effect it—a most undesirable feature. However, a compound of changeable ratio is now available, giving a wide range of price variation, and capable of external adjustment. This is a real improvement, greatly facilitating *in situ* alterations necessitated by extra load without the aid of a skilled mechanic. These "variable standing charge compounds" have a range of from 3d. to as much as 8s. per week.

Synchronous motors are capable of overcoming increasing friction within their limited torque. Most manufacturers have been using this low-torque motor, which is quite adequate providing the mechanism is well designed, mechanically assisted in its "running out," and friction is kept to a minimum, and a little pull in reserve will overcome increasing friction.

Arrears

There are still varied opinions regarding the limit of the "arrears run," different makers operating between 4 and 40 coins, but I believe this to be of little consequence, as there is generally little to be gained by a "long run" of arrears, excepting an indication of the amount owing. A reasonable limit, say about ten coins, with the addition of an "arrears device," I consider adequate. By this clever addition the consumer in "arrears" does get something for his money, as the insertion of one shilling will cancel ninepence of the debt and allow him three-pennyworth of electricity which, if not immediately used, would be transferred to the standing charge in the normal way.

The success of the two-part tariff prepayment meter raises the question as to its necessity when cookers or water-heaters are in use, considering its excess cost over the ordinary prepayment meter, as under a reasonable tariff the consumer gets his "all-in" at somewhere between 0.8d. and 1.25d. per kWh. Secondly, it is not the enforcement of the standing charge that brings about the wanted result, but the regular use of the apparatus. The "all-in unit" on a simple prepayment meter must eventually become more popular among consumers already bewildered by complicated technicalities.

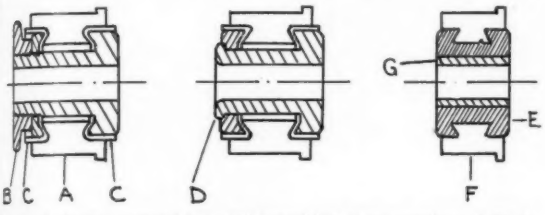
Fractional H.P. Motors. By S. F. Philpott, A.M.I.E.E.

Notes on their design and manufacture

IN the manufacture of fractional horse-power motors for domestic appliances cheapness in production is essential, because the motors generally form only part of appliances which have to be sold at competitive prices. Reliability is equally important for, although the motors are not operated so continuously as industrial ones, they frequently work under much worse conditions.

The energy consumed by small machines is so low that running costs are negligible, although the efficiency of these small motors is inherently low.

Choice of wire for the armature, insulation, and method of winding have a considerable influence on the total cost and reliability of the motor. The wire used ranges down to 0.004 in. diameter (No. 42 s.w.g.), and the designer has the choice of enamel, cotton, and silk insulation, single or double in the case of the last two. Enamel and the single cotton and silk coverings are attractive on account of their lower cost, but they



Screwed sleeve, pressed-up and moulded commutators (left to right)

are unreliable. Double silk is best on account of its superior insulation qualities and the small space it occupies in the slots. Its cost is high, however, and cotton is used wherever possible. The slot space factor when using double cotton-covered wire is not so good as with enamel and silk coverings, but can be allowed for in design.

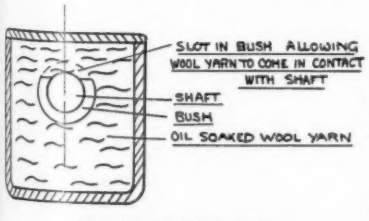
A variety of cotton covering known as "special fine" is useful; this is slightly dearer than ordinary cotton, but the improved space factor counterbalances the cost. A motor designed for cotton-covered wires has the advantage that it can be wound with many more turns of silk-covered wire should special occasion arise.

The cost of insulating the armature slots is so small that, to avoid the risk of complete failure through skimping, only the best material should be used. Two thicknesses of insulation are desirable (one of 10 mil empire cloth and one of 5 mil leatheroid or presspahn are a good combination, the empire cloth being next to the iron).

Winding the Armature

Three methods of winding are in general use, all having their advantages and disadvantages. Hand winding is slow and costly, but it gives a better space factor than former winding and, when done by a skilled winder, is very reliable, as every part of the wire passes through the operator's hands and any flaws or breaks in the insulation are readily detected. Hand winding is useful in the case of repair jobs and where only a few armatures are required. When used for comparatively high voltages there is, however, a risk of breakdown in the end windings due to lack of insulation, other than the wire covering between coils.

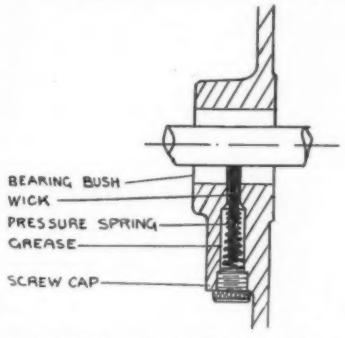
With machine winding remarkably good timing can be obtained by well-trained girl operators. The winding machines are quite reliable in use and with a good type of machine it is possible to wind wire as fine as No. 42 gauge. A disadvantage is the tendency of the coils to pile up and produce bulky end windings and consequent out of balance. As with hand wound armatures, there is risk of short-circuits between wires of the end windings unless precautions are taken to insert a slip of insulation, *e.g.*, varnished cloth, between the coils.



Wool yarn lubrication

Former winding is usually used for moderate sized machines as it readily lends itself to mass production, all the coils being identical in shape. It gives a mechanically and electrically well-balanced armature, a feature which is absent in the case of hand and machine wound cores. From the point of view of rapid former winding open slot stampings are best, but are not at all desirable, as they give a very tapered tooth in small diameters, and the number of teeth must be less than with semi-closed slots. In any case, it is comparatively easy for a skilled operator to wind a core with semi-enclosed slots. If necessary, former coils can be tapered on their sides only, to allow the coils to enter the slots readily, but there is considerable risk of breakage of wires when feeding them into the slots.

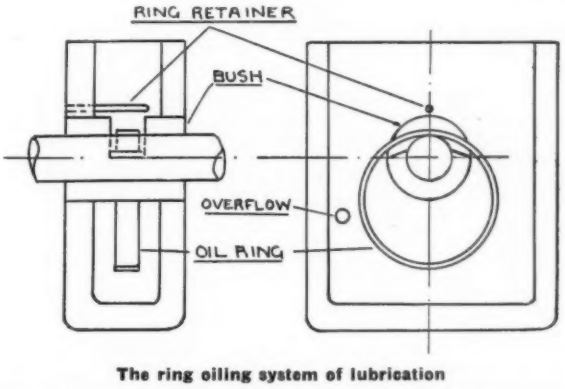
In a screwed-sleeve commutator the assembled segments A, after being suitably recessed, are clamped endwise by the pressure of the nut B. During assembly this nut is tightened gradually as the bonding material is expelled from the micanite vee-ring C. For the pressed up construction the clamping is effected by riveting over the end of sleeve D under a power press. In the moulded construction the hub E is of bakelite, the copper and mica segments F being assembled in a suitable jig prior to moulding. It is usual to include a metal sleeve G in the moulding.



Lubrication by grease and wick

Of the three methods I prefer the first, although it is the most expensive. I believe that the clamping operation is better done gradually than by one sudden blow, although the majority of small mass-produced commutators are made by the second process and rarely give trouble.

The moulding method is the cheapest, but commutators made in this way have not always been satisfactory, due to the tendency of bakelite to "track," *i.e.*, form minute conducting paths on its surface, so allowing a leakage of current to earth, which eventually develops into a short circuit. In the case of commutators the trouble is aggravated by the presence of particles of carbon dust. Much research has been expended on this problem and there is evidence that the trouble is becoming less general in recent forms of moulded commutators.



The ring oiling system of lubrication

The Field System

With regard to field magnets, most manufacturers adopt the laminated construction up to about ½ h.p. In designing a field stamping two points are of particular importance. First the coils must assemble easily on to the poles, without sacrificing pole arc; and, secondly, the rivets must be so spaced that the laminations are held tightly together, otherwise there is risk of humming on a.c. circuits.

Enamelled wire, provided it is of first-class quality, is satisfactory for series windings. Care has to be taken in insulating any cross-over leads. Field coils must be well taped. A layer of 7 or 10 mil empire taping next to the wire, with a layer of Egyptian cotton tape on the outside, gives good protection both electrically and mechanically.

The question of varnish impregnation depends on the covering of the wire forming the coils. Cotton and silk coverings need impregnation owing to their hygroscopic nature, but enamelled windings are better left untouched, the outer taping merely being given a coat of air drying finishing varnish. There is considerable danger of softening the enamel if impregnation is attempted on this class of wire.

Small motors (up to ½ h.p.) are almost invariably made with

fixed brushes, although provision for a certain amount of brush rock is a great advantage from the production point of view, as it enables more uniform performance from a batch of motors. Square or rectangular brushes are preferable to round ones; indeed, I think the latter should be definitely avoided as they are generally noisy and tend to spark at the tips.

There is no doubt that ball type bearings are better for hard wear, but they are more costly than bush bearings. In small sizes they are inclined to be noisy, a point which is of considerable importance in many applications of small motors. For the majority of uses phosphor bronze bushed bearings are quite satisfactory if properly lubricated.

The most popular systems of lubrication in use are the oil ring, wool yarn, and the wick lubricator. The oil ring system is rarely applied to motors under ¼ h.p. The oil impregnated wool yarn system appears to be the most popular to-day, although I prefer the wick system, particularly for commutator motors, as there is less risk of oil getting into the windings and brushgear. A recent development in small motor bearings is the absorbent type of bush. Hitherto these have been available for comparatively low-speed shafts, but they are now being employed in small motors running at higher speeds.

A good glossy black enamel remains the most popular finish. Cast-iron is generally employed for the body of the motor, but where production is sufficient to warrant the heavy tool expenditure, die castings of a zinc base alloy, or bakelite mouldings, can be advantageously used instead. So far bakelite casings have only been used for very small motors.

Domestic Electrification in Cape Town

By our South African Correspondent

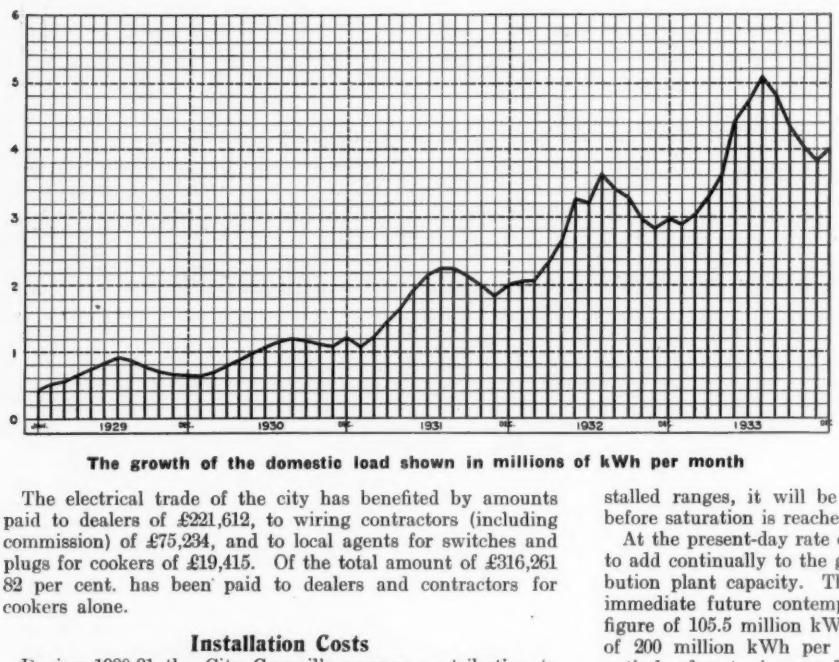
REMARKABLE progress continues to be made in the domestic electrification of Cape Town and district as a result of the special campaign instituted four years ago. The developments have already necessitated the institution of two 20,000-kW, 33-kV turbo-alternators and four 100,000-lb. boilers, and the provision of new sub-stations and cables for distributing supplies to domestic consumers. A third 20,000-kW unit will be put into commission next May.

The results achieved by the scheme for the hire-purchase of appliances, and the subsequent increase in the domestic load, have exceeded the most optimistic forecasts. Before the scheme was introduced in September, 1930, only 1,050 electric cookers were in use. Over 200 cookers were purchased during the first month of its operation, the average rate thereafter being 125 per month until December, 1932, when the instalment period was extended to two years; from that date the average rate has been 225 per month.

A Large Load

Altogether 7,046 cookers, with a total retail value of £190,889 and a total connected load of 47,225 kW, were purchased during the first three and a half years of the scheme. In addition, there have been purchased 1,203 major appliances, such as refrigerators, water heaters, washing machines, boilers, and large toasters, having a total retail value of £62,302 and a total loading of 703 kW, as well as 750 minor appliances, such as kettles, percolators and irons, with a total retail value of £1,622 and total loading of 610 kW.

In 1930-31 the total loading of the various types of appliances purchased under the scheme was 11,057 kW; in 1931-32, 11,515 kW; in 1932-33, 16,893 kW; and in 1933-34 (six months), 9,074 kW.



The growth of the domestic load shown in millions of kWh per month

The electrical trade of the city has benefited by amounts paid to dealers of £221,612, to wiring contractors (including commission) of £75,234, and to local agents for switches and plugs for cookers of £19,415. Of the total amount of £316,261 82 per cent. has been paid to dealers and contractors for cookers alone.

Installation Costs

During 1930-31 the City Council's average contribution to the cost of installing a range was £7 12s., which amount has now been reduced to £2 12s. Taken over all the appliances sold during the operation of the scheme, the average contribution per kW connected amounted to 7s. 4d. This outlay is considered low.

The domestic tariff is now 1s. 6d. per room per month, plus ½d. per kWh; outside the municipal boundary, namely, at Simonstown, these rates are subject to a surcharge of 25 per cent. The householder living in a house of from three to six rooms in Cape Town pays no more, on an average, than from 5d. to 8d. per day, and 6d. to 10d. per day in summer and winter, respectively, for electric lighting, cooking, heating, and refrigeration. Cape Town has a temperate climate, the average minimum and average maximum temperatures in the shade recorded in the winter and summer months over the last twenty-four years being respectively 47 deg. F. (falling occasionally to 29 deg.) and 80 deg. F. (rising sometimes to 104 deg.).

Mr. G. H. Swingler, M.I.E.E., city electrical engineer of Cape Town, under whose direction the domestic campaign has achieved excellent results

At the end of February, 1934, the total number of consumers in the area of supply was 35,800, of which about 22,000 were domestic. The latter had an average consumption in 1933 of 2,300 kWh. On the other hand, 3,513 consumers who bought cookers under the hire-purchase scheme before the end of 1932 consumed an average of 4,000 kWh, exclusive of water heating, during 1933. The difference between this and the average domestic consumption indicates the scope for an increase in the sales of electricity to domestic consumers, quite apart from the increases which will be brought about through further sales of heating and cooking appliances. Also, as there is a shortage of houses in Cape Town running into thousands, and not more than 7,000 domestic consumers have installed ranges, it will be seen that many years must pass before saturation is reached.

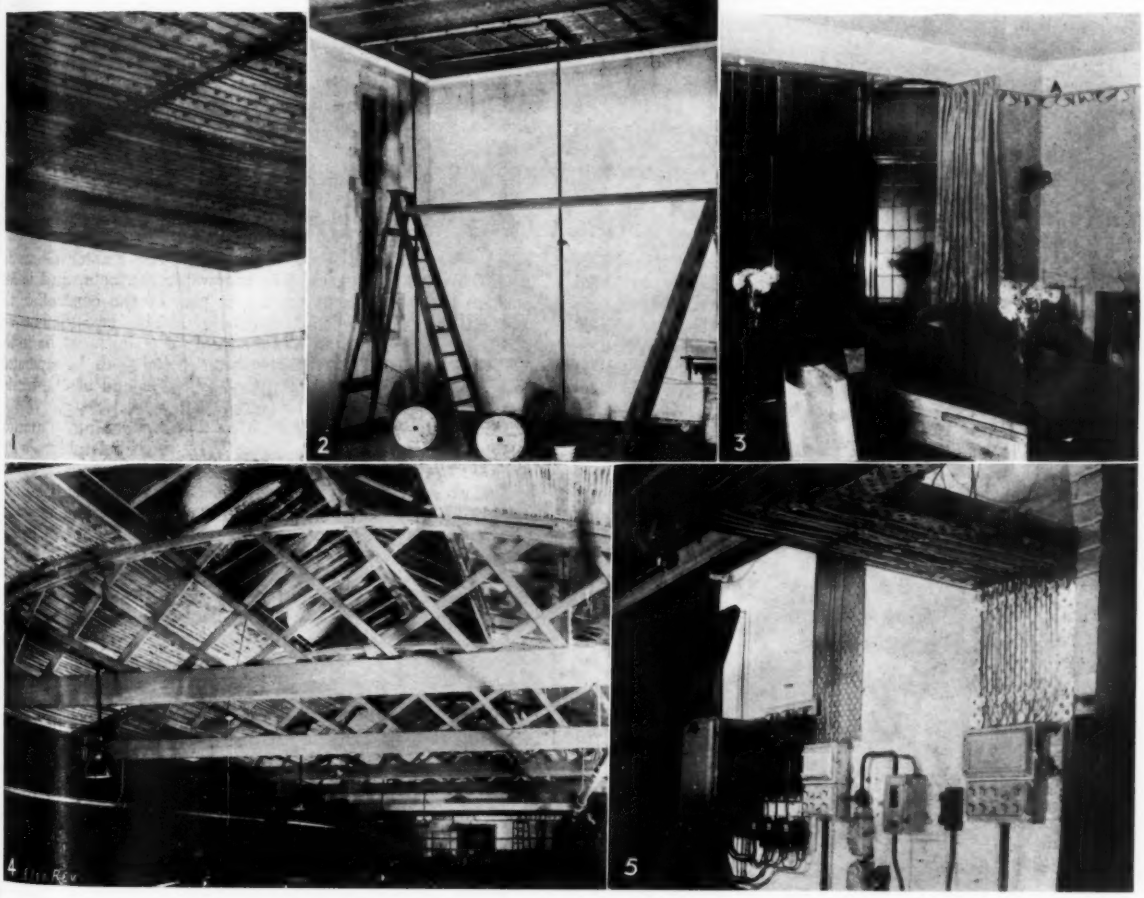
At the present-day rate of growth of the load it is necessary to add continually to the generating, transmission, and distribution plant capacity. The development programme for the immediate future contemplates sales rising from last year's figure of 105.5 million kWh (48.7 million domestic) to a total of 200 million kWh per annum within six years, almost entirely due to increased use for domestic purposes. The proportion that domestic consumption bears to the whole was 46.2 per cent. last year, compared with 11.6 per cent. in 1928.

Low Temperature Space Heating

Features of recent domestic and industrial installations at Huddersfield

THE applicability of low-temperature space heating to both domestic and industrial buildings is shown by the success of two installations of the "Health-Ray" system (produced by Messrs. Johnson and Phillips) which we recently inspected by courtesy of the inventor, Mr. J. H. Taylor, of Messrs. J. H. Taylor & Co., electrical contractors, Huddersfield.

The system emulates natural warming by evenly raising the temperature of surrounding surfaces slightly above the enclosed air temperature, so that all objects within the enclosure are subjected to radiant heating at low temperature gradients. For convenience, it is usual to utilise the ceiling only of any enclosure, as generally this alone offers an uninterrupted surface for even distribution. Uniformity is achieved by distributing low and medium specific resistance metal and alloy conductors of relatively large sectional areas evenly over the surface. The practical result of an installation is the greatly extended application of a wiring system which conforms to the I.E.E. Regulations for the Electrical Equipment of Buildings, except that copper conductors are not used.



Low Temperature Space Heating Installations at Huddersfield

1. A bedroom at the Thurstonland rest home, showing containers complete with covers and ready for papering. 2. The telescopic tubular frame used in erecting the container bases and covers is seen in this picture of the Huddersfield Drill Hall. 3. A completed lounge showing A, connection between containers around the beams, and B, thermostat. 4. A large shed at the Manor Mills; on the left is the bay equipment ready for covers, and on the right lined containers without conductors. 5. Control gear at the mills

Heating a Rest Home

One of the installations is in a rest home established for the benefit of his employés by Mr. J. H. Heywood, the proprietor of a large Huddersfield store. The home is situated at Bank End Green, Thurstonland, in an exposed position 1,000 ft. above sea level. It is a partly modernised 300-year-old building constructed of Yorkshire stone with a stone tiled roof. There are seven rooms, kitchen and scullery, corridors, garage and barn, and the "Health-Ray" system is applied to all the major rooms and corridors. The total capacity of the building is 20,000 cu. ft., and the total loading of the heated portion (14,000 cu. ft.) is 11 kW or about 800 W per 1,000 cu. ft.

Only half an air change per hour is provided for in the case of the rooms and one change per hour for the corridors, as the system is almost entirely radiant and actual air heating can therefore be largely reduced. The installation is designed to maintain 62 deg. F. downstairs and 58 deg. F. upstairs when the outside temperature is 32 deg. F. All the rooms are separately controlled. Each has two independent circuits with separate switches, and the whole room equipment has over-all automatic control by a thermostat.

One bedroom, for example, has a capacity of 1,800 cu. ft., is 9 ft. high, and has two 655-ft. or 655-W circuits. The lounge, of the same capacity but only 7 ft. 3 in. high, has a loading of 1,785 W provided by a 1,302-ft./W and a 483-ft./W circuits. There is a considerable area of external wall and glass to this room.

It was surprising to see the ease and accuracy with which the cables were laid out, this being made possible by a simple but well conceived system of housings and fixings for the conductors. The standard metal container has a perforated base to which numerous hollow raised metal discs are attached, suitably spaced to provide paths for the conductors, and with intermediate discs to secure the covers. The units are cut to size and when installed are completely interconnected, the whole being mechanically and electrically continuous in all directions and efficiently earthed near to the point of supply.

At the rest home the average loading of the containers is 8.5 W per sq. ft. and the conductors are spaced an average of 1.4 in. Each circuit is run out to the distribution board with a pair of "blue and white" conductors installed in the containers and looped into the appropriate switches and thermostats. These "blue and white" circuits (7/0.029) have a far greater loading than any of the other (3/0.029) resistors. They are intended mainly for use as feeds for the circuits, looping from room to room until they are fully loaded, but they

may also be employed as large-capacity heating circuits although it is generally more economical to build up the heating circuits with 3/0.029 conductors (resistors).

The building must have been one of the most difficult to equip, for the ceilings are faced by cross beams in very irregular fashion, so that the conductor units had to be broken up in respect of heat emission and made continuous by carrying the metal bases and conductors around the beams near the walls. In installations upon existing ceilings, we were told, the container covers may be in plain or embossed sheet metal to provide painted metal ceilings, or they may be suitably corrugated to provide the necessary key for the usual plaster ceiling to be reproduced. In new buildings either of concrete or wood joist construction, the container assembly can constitute the finished ceiling surface in either metal or plaster, the economy thus effected providing a considerable offset to the cost of installing the system.

Cloth Mill Scheme

The industrial installation is at the Manor Mills (Huddersfield) of Messrs. Hobson, Son & Co., Ltd. There are two sheds and a block of offices. One shed has a capacity of 54,000 cu. ft., the other 27,000 cu. ft. and the offices 3,200 cu. ft. The installation is designed to provide 57 deg. F. when the outside temperature is 32 deg. F., and the actual loading of the system is 40 kW. During working hours casual heat generated results in about 30 kW, and conditions of almost continuous radiant warmth comfort are maintained for the operatives by reducing the radiation to half or quarter the full capacity soon after work is commenced.

The joists, spaced at 2 ft., are 4 in. deep, and are lined with asbestos-aluminium diaphragms forming the conductor containers. This aluminium-coated asbestos is an advance on the slab asbestos base, and the ease with which it can be applied to any roof construction renders it ideal where additional heat insulation is required. The diaphragms are held to the joists by zinc angle pieces, and there is a 2-in. air space between the diaphragms and the roof and a similar air space between the diaphragms and the wires. Heating units are built up between lattice beams spaced at about 10 ft., and at each end metal base strips with discs support the conductors in similar fashion to the scheme already referred to. The conductors rest upon the covers and are in heat conduction contact with them. The covers are of sheet zinc, and are painted black inside and white outside to provide both maximum absorption and emission. Radiant heat from the conductors is reflected upon the metal covers by the polished diaphragms, and the resultant heat insulation is very high.

The large shed has a total load of 26.7 kW and the small shed 12.2 kW, representing a distribution in each case of 8 W per sq. ft. and 500 W per 1,000 cu. ft. The offices have a total loading of 1.8 kW with a distribution of about 10 W per sq. ft. and 650 W per 1,000 cu. ft. The total length of the conductors is eight miles, and the area over which they are distributed is 5,000 sq. ft. Either quarter, half or full load may be provided. The whole installation is governed by a time switch, and within the limits of this it is thermostatically controlled. Hand control is provided as a convenience, while a change-over switch for the office circuits gives thermostatic control either separately or in conjunction with the control for the mill proper. The circuits are balanced between the phases and neutral of a three-phase supply. This installation has replaced a steam-heating one served by an independent boiler, and Mr. W. Hobson expressed appreciation of the resultant freedom from stoking activities before heat could be available in the morning. The installation was not complete at the time of our inspection, but the circuits in position were already "on," indicating the flexibility of the system.

Trolley Buses for Durban

A FLEET of eleven four-wheel double-deck trolley-buses has recently been shipped from this country to Natal for use on the Durban municipal tramways. The chassis were built by Leyland Motors, Ltd., and the electrical equipment was manufactured by the General Electric Co., Ltd.

Each bus has a single series-wound field-controlled electric motor rated at 80 h.p. on the one-hour basis at 500 V. The box frame is fabricated and hum has been eliminated throughout the entire range of speed; access to the brush gear is provided through large detachable covers at the top and bottom of the motor. The windings are cooled by a "parallel flow" fan mounted on the armature. The bearings are of the roller anti-friction type, lubricated by high melting point grease.

One of the Durban trolley buses, and (right) the 80-h.p. "Witton" motor

As the motor is mounted towards the centre of the chassis, a short propeller shaft can be used, leaving ample room for the accommodation of auxiliary control gear on the chassis frame. No electrical interlocks of any kind are necessary. A foot-operated master controller actuates a bank of electromagnetic contactors, which first cut out resistances step by step until the motor is connected across the full line voltage, and finally weaken the series field by shunting it with suitable resistances until full speed is reached. The master drum has adjustable spring fingers with renewable contacts, and is carried on ball bearings in the upper part of the controller, the reverse drum being mounted below. The two drums are mechanically interlocked so that the foot pedal must be in the "off" position before the reversing switch can be operated. The reverse handle can be applied at either end of the master controller, whichever is the more convenient.

The accelerating and the series field-weakening contactors are all of one type, closed by vertically mounted solenoids and opened by gravity supplemented by suitable springs. A "toe and heel" movement is given to the contacts, resulting in a wiping action; the arc chutes are fitted with strong magnetic blowouts. The contactors, with the bakelite panel on which they are mounted, are enclosed in a wooden case, thus minimising the noise of operation reaching the passengers.

Two automatic overload circuit-breakers, one on either pole, are fitted with contactor-type mechanism and magnetic blowouts. In addition, each circuit is double-fuse protected, the auxiliary circuit being provided with main fuses and also separate fuses for each circuit, all of the cartridge type.

The collector gear comprises two light-weight low-type Brecknell Willis trolley bases, having "Timken" taper roller bearings and "Tecalemit" lubricators. Each base is fitted with a tapered rolled weldless steel tube pole, taped and insulated and carrying a trolley head complete with wheel and safety cord. For running on ordinary tramway routes on which the second overhead wire is not available, a skate is provided on the undercarriage.

The exhauster for the power brake is directly driven by a totally enclosed motor, being flange-mounted on the motor end plate and arranged for automatic switching direct on to the line. "Stopper" coils contained in insulated cases of light aluminium are mounted on the roof to prevent wireless interference. An indicator for detecting any leakage of current to the metalwork of the trolley bus is fitted, and another indicator shows when the trolleys have been put on the wires.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Automatic Boiler Control

MEMBERS of the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS discussed on December 4th the paper on "Automatic Boiler Control," by Mr. S. J. Clifton, which was referred to in the ELECTRICAL REVIEW of December 7th.

Mr. I. F. G. McVicker (Messrs. Allen West & Co., Ltd.) stated that the Bailey three-element feed water control was not a necessary adjunct to the Bailey automatic control. It met the requirements of the modern high-pressure boiler in which the water storage space was sufficient only for a period of operation of 20 or 30 sec. in the event of feed failure. For boilers of this type control operated by level alone was far from satisfactory. Good feed control assisted the operation of the master pressure controller, and the Kent system was just as dependent as any other on good feed control.

Mr. McVicker said he was unaware of any complete system of Kent automatic control utilising the measurement of air by tappings across the boiler passes. At Hackney it was measured by tappings in the forced draught ducting, a practice which was open to criticism in that infiltration of air was entirely ignored. He believed Messrs. Kent had used tappings in the boiler passes in some cases for semi-automatic control.

A further point of criticism was the use of cams in the control. He doubted the possibility of obtaining a single cam to suit all conditions; if a number had to be used at whose discretion were changes made? The Bailey steam flow-air flow meter could be designed to give a variable excess air rating without any adjustment to the instrument.

An automatic controller was by its nature a complex machine, and in considering its installation there should be careful investigation not only of the load characteristics of the station, but also to determine whether the control gear was likely to be maintained in an efficient condition after installation. One or two control installations neglected and permitted to become inoperative might adversely affect development.

The steam flow-air flow method of combustion control, although not favoured by Mr. Clifton, had been accepted during the last few weeks for installations at the station of Edmundson's Electricity Supply Corporation at Stourport for four 250,000 lb. units and by the Swansea Town Council, on the advice of Messrs. Preece, Cardew & Rider, for four rather larger units at the Tir John station.

The author's reference to Lancashire boilers giving an efficiency of 65 per cent. was commented upon by Mr. J. S. Cargill, who said that a boiler plant which he was in charge of had, during the last five years, an efficiency of 82.5 per cent. That result had been achieved without the aid of elaborate apparatus. Mr. Clifton could not expect to do anything very much better and it would be absolute waste of money to install elaborate automatic control apparatus on a Lancashire boiler working at that efficiency.

Mr. J. W. Gibson (past president, Association of Mining Electrical Engineers) said that the control of the fan by shunt regulators indicated the use of d.c.; he supposed it was probably the ideal method of regulating the output of either a forced or induced draught fan. With regard to damper control of large volumes of air or gas, he suggested there might be difficulties on account of very high velocity through slightly opened damper blades.

In reply to Mr. J. M. Macdonald, referring to the Hackney power station where the Kent system has been in continuous operation for 2¼ years, Mr. Clifton stated that some increase of efficiency was due, of course, to the increased load factor, but there was no doubt whatever that a slight increase in efficiency was also due to automatic control. Mr. W. A. Davidson suggested that the efficiency of the automatic control system depended to a great extent upon the proportion of secondary air to the total amount of forced draught.

Questioned by Mr. C. L. R. Busby as to the length of service of automatic plant, Mr. Clifton said that the Kent master controller had been operating at Hackney for 2¼ years continuously and the only maintenance required was to top up the oil reservoir once a month; there had been no breakdown. Mr. R. G. Cooper (Hydraulic Coupling & Engineering Co., Ltd.) remarked that time lag in hydraulic couplings had been practically cured in the latest designs. Mr. F. C. Knowles, the chairman, said that from an instrumental point of view the various parts of control apparatus in boiler houses were extremely robust and maintenance costs were low.

Warming Large Buildings

THE paper entitled "A Critical Examination of the Present Practice Relating to the Electrical Warming and Air-conditioning of, and the supply of Hot Water to, the Larger Buildings," by Messrs. R. Grierson and D. Betts, which was reviewed last week was discussed at a meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 6th.

Dr. E. Griffiths pointed out that with excellent electrical control one was justified in giving considerable attention to the prevention of heat loss from buildings. The problem of the future was the production of fabrics and materials for heat-insulating buildings, and electrical engineers would have to study the methods of cold storage. He wished the authors had dealt in greater detail with air conditioning, which was needed for only a short period each year. The production of humidity was of some importance.

Dr. Oscar Faber said that while the paper dealt with the technique of heat application, its implication that the electrical method was suitable for very large buildings whose only requirement was heat, had not been proved. The costs of producing a "therm" from coke and by electricity by no means favoured electricity. They all knew why, but they did not all choose to recognise the reason. He wished that the authors had differentiated between direct electrical and hot-water systems.

Some of their figures were fallacious, for one did not attempt to warm up the foundations and outside walls but only the inside skin of 1 in. or so in thickness. Therefore the times and amounts of heat stated by the authors to be needed were not correct, and the capacity required to warm up must be greater than that needed to maintain temperature. The strong conclusion formed by the authors with respect to the thermal-storage capacity of building materials had not been made use of in subsequent sections of the paper. The great convenience of electricity had a definite value in some cases,

Christmas window displays by two municipal undertakings—Ilford and Croydon

but it did not exercise the same influence in very large buildings whose only need was heat.

Tariffs and Control.

Mr. L. C. Grant thought the data in the paper useful and each user could make his own corrections. The drawbacks said to be associated with electrode boilers had not materialised. One of their most useful applications would be to small industrial steam installations. He had just installed plant in Liverpool for which a tariff had been obtained that would completely alter the outlook of its user. Proper thermostatic control would obviate much of the thermal-storage capacity usually considered necessary. The economics of electric heating could be changed by suitable avoidance of peak periods. The fact that the heating installation could also be used for cooling and air conditioning should be stressed. The reversible heat pump had been made practicable in this country, but had found its application in America. Thermal control gear tended to be complicated and not very reliable, which gave good heating plant a bad name. Therefore it must be kept simple.

Mr. J. R. Cowie considered that cable limitations would cause distribution engineers to think in terms of 22,000 V for heating buildings, as lower voltages would not go far enough. Regarding tariffs, 1,200 and 1,400 kWh per £1 had been quoted for some years. Some of the authors' figures were not comparable. Ceiling panels were not so satisfactory as wall and floor panels. The best combination would be panels assisted by direct radiators. The latter, being luminous, could be made artistic and produced pleasant results. He quoted consumption, loss, cost, &c., details of a number of installations to indicate that many of the figures given for existing plant were too high and should not be accepted when comparing the electrical with alternative methods. A suggested means of immersion and electrode heaters was the removal of earth leakage from the network and its application to the apparatus itself.

Heat-insulated Windows.

Mr. W. R. Cox suggested that windows, which represented a large area in modern buildings and factories, might be heat-insulated by, say, double panes. He expected electrode boilers to grow in popularity; it was simple to design them to suit different kinds of water, which varied greatly. The tendency towards multiple earthing might be an advantage eventually, and steam boilers could be made with insulated neutrals.

Col. F. S. Newcome said that the fact remained that large buildings did absorb a considerable amount of heat. If the inside surfaces were insulated much less heat would be needed. No standard air-to-air transmission value through roofs, walls, &c., was yet available. The Ministry of Health might with advantage determine the economic value.

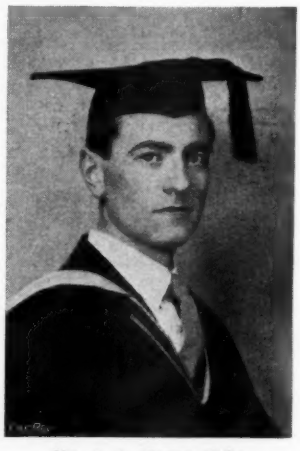
Mr. W. L. Shand considered that electric thermal storage could compete, even in cost, with other methods of domestic water heating. But the ordinary householder had a rooted idea that electricity was dear, and consequently prices were lowered to such an extent that the supply authority had to rely on the diversity factor to avoid bankruptcy. The natural diversity in some large systems was remarkably high, but for small installations time switches and load levellers had to be employed to keep low-priced consumption out of the peak period. Such devices must not be installed on consumers' premises; they were suspicious of them and disliked the bother of inspection and adjustment. One way of avoiding such things was to use the Wilkinson change-circuit system.

"Amenity Values."

Mr. D. Betts, in reply, declared that one of the greatest obstacles was the architect himself, who would not make the necessary allowances in his costs and estimates. The cost of heat-insulation could soon be recovered, but no reliable text-book figures relative to heat insulation were available, apart from manufacturers' claims. Proper comparison could not be made on the basis of the relative costs of producing a "therm" from coke and electricity. The electric heating figure was 0.2d. per kWh, which was arrived at by adding to the price of 0.1d. per kWh 0.5d. in respect of labour saved and another 0.5d. in respect of amenity values. He agreed that lump sum offers could be made to heat buildings irrespective of the weather conditions. The reversible heat pump had no chance in this country, except possibly in the case of some swimming baths. In America it had been used in buildings in which large refrigerating plant was installed in any case for use during the summer.

Meter Department Reorganisation

THE increasing use of a.c. is reducing the amount of d.c. meter testing that has been required in the past. Consequently the testing equipment of the meter departments of many supply undertakings will need to be extended or redesigned. To help in this task suggestions on equipment and routine are offered by Mr. J. L. Ferns in the first and second parts of the paper which was read before the Meter and Instrument Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 7th.



Mr. J. L. Ferns, B.Sc.

The errors of the instruments used for testing meters should be determined from time to time. It should be possible for all electricity undertakings having more than 5,000 consumers to carry out this operation on their own premises, and Part 3 of the paper suggests the minimum of standardising equipment with which they should be provided.

Although, owing to its almost ideal construction, it was found possible to dispense with the rotor clamp in the induction meter, this omission is not an unmixed blessing. If the light-weight induction meter is to be given the same treatment in transport as the robust, clamped-type d.c. meter, then the removal of the clamp is to be regretted. Part 4 deals with this matter and with other points connected with the transport and installation of meters.

After the meters have been installed on consumers' premises they need to be read and also will create various types of complaints, and naturally faults will occur from time to time. In Part 5 the equipment for dealing with this work is discussed, and what the author considers to be the correct attitude towards meter maintenance is defined. He advocates regular maintenance visits to reveal faults that can be rectified before a drop in registration compels investigation, which procedure the author would like to avoid.

Instruments and accessories which would enable meters to be tested on site, possibly without interrupting the consumer's supply, are special requirements.

Main Road Lighting

ELECTRIC discharge lamps and their application to road lighting are dealt with in the paper by Messrs. H. Warren and L. J. Davies which was read before the INSTITUTION OF AUTOMOBILE ENGINEERS at Coventry on December 11th.

The authors, both of the B.T.H. Research Laboratory, point out that road engineers, by the adoption of new methods and surface materials, arterial roads, unilateral roads, island sites, traffic signals, &c.; and automobile engineers, by improving such things as power, springing and braking, are together bringing road travel to a remarkably comfortable stage of efficiency and progressing towards greater safety in the daytime. After dark, however, there is less comfort and safety. Drivers often cannot see surely what lies ahead, are dazzled by certain headlamps (and sometimes other lamps), and must reduce speed in consequence. The authors submit that the vast cost of installing and maintaining our road systems justifies consideration of the relatively small cost of equipping suitable stretches of them with lighting systems designed to facilitate safe and efficient night-time road use.

It is important that roads shall be lighted evenly, so that the road itself will not present intensity contrasts; such a light flux should be provided that adequate distinguishing at speed is comfortable. There must be avoidance of abrupt discontinuance of a brightly lighted stretch of road. With regard to the light flux required, it is very difficult briefly to make a definite statement; a flux of from 0.2 to 2 lumens per sq. ft. is usually adequate. The amount, however, will depend upon the road surface material, the angle at which the light falls upon the road, and the amount of stray light entering the eye. Usually, economic considerations prevent an ideal quantity of light flux being used in an ideal way, and the art of road lighting is largely the devising of skilful compromise.

The present definite view is that the only possible expedient for the near future is to extend the existing system of mounting illuminants on poles, and to make this efficient by concentrating on three main factors, namely, (i) the production of very high efficiency lamps; (ii) accurate control by specially designed lanterns of the light flux derived from the lamps; and (iii) control of the reflection from the road surfaces.

Discussion of these three factors leads, first, to the claim that the promised high efficiency of discharge lamps has been fulfilled, and, secondly, to the prophecy that the permanent road lighting of the near future will be by means of this type of lamp. Practical forms of discharge lamps and the design of lanterns in which to enclose them for properly distributing the light flux are described in detail.

The authors wonder whether a small lamp on the car will ever be used for the photo-electric switching on of a stretch of road lamps ahead (a time delay or other switch being employed for switching off after the car has passed) during the very late or early hours. Photo-electric switching of lamps as the daylight goes and comes has, of course, already been done.

The total expenditure by local authorities in Great Britain upon maintenance, improvement, cleaning and construction of highways and bridges in the year 1931-1932 was £78¼ million, and it seems reasonably safe to say that more than 500 miles of selected roads could be illuminated properly for a capital expenditure of less than 1 per cent. of this sum. If the whole of a hundred-mile modern Class 1 road between two large cities were properly illuminated, the capital cost of the illumination installation (according to availability of power) would probably not exceed 3 or 4 per cent. of the capital cost of the road, and the annual cost of the illumination would probably not be greater than that of the normal annual maintenance, &c., of the road.

It has been suggested that probably existing telegraph poles could be employed for carrying overhead cables, and in certain cases also for accommodating the lamps and lanterns along main roads. This would greatly cheapen installation costs.

Superheaters for Water Tube Boilers

AT a meeting of the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on December 3rd, Mr. H. E. Geer, of the Superheater Co., read a paper on superheaters, to which reference was made last week. Mr. W. M. Selvey remarked that this paper was the first one on this subject since Mr. Bruce had expressed himself at great length at the Institution of Electrical Engineers in 1932 on the troubles that had been experienced with Mr. Geer's superheaters at Barking. The present paper indicated that, if ever there had been a complete "come back," the author's company had succeeded in making one. Actually the troubles at Barking were trivial, but they had involved certain fundamental problems which had since been dealt with.

The provision of a suitable alloy, said Mr. Selvey, was by no means simple. It was possible to increase the creep limit without altering the anti-corrosive properties, but the ductility would be affected. Alternatively, they could improve the anti-corrosive properties, but not the creep limit, or improve both the creep limit and the anti-corrosive properties at the expense of ductility. The troubles of the superheater makers had been largely due to their being left to fit their plant in where they could find a place for it, but fortunately boiler makers had been compelled to acknowledge that the superheater had become practically the principal element in steam generation under modern conditions.

Many of the author's early troubles had been due to the fact that he had been compelled to fit forced circulation superheaters into natural circulation boilers. Fortunately, all these troubles were disappearing and the superheater makers were being given more freedom of action, which meant that the design could be improved. Already an alloy was available which would stand up to 1,100 deg. F. for very considerable periods, but the turbine makers were not yet ready to accept such a temperature.

It was emphasised by Mr. H. M. Armacost, of the Superheater Co. of America, that for high pressure and high temperature work the steam must be really clean. A generating set had been known to lose 200 kW per day, with the same amount of steam passing through, due to the efficiency of the turbine blades being cut down by the deposit of salts. If the water going into the boiler were mixed with the steam from the boiler, thus diluting the moisture in the steam, and a method of separation was afterwards applied, the concentrates in the moisture could be reduced to about 1 part per million or less, whereas it was common to have 10 parts per million or more, depending on the design of the boiler.

Plants with low-make-up had been dealt with satisfactorily by putting sprays in the drum and allowing the spray of water and steam to go through to the separator. Where the make-up was of the order of 1 to 1½ per cent., it was relatively easy to clean the moisture, but where, as for process purposes, the make-up was, say, 75 per cent., there had not been the same success. There was need for more uniform feeding which would make it simpler to control the concentration in the boiler drum. At present, the throw-over of solids into the superheater was intermittent, and uniform feeding would assist in handling the problem.

Mr. L. M. Jockel spoke of the effect of high superheats on maintenance. Above 750 deg. there were troubles with valves which might not, however, show themselves for three or four years, but then the makers insisted that the user should pay for the renewal, which was expensive. He was averse to water and steam being utilised together under high temperature or pressure, and he still had to be convinced that when water was injected into a body of steam the water was totally absorbed by the steam. Mr. Jockel recommended the use of independent superheaters.

The author, in reply, asked users to appreciate that they were taking a hand in new developments and that they should assist by treating the plant with care and sympathy. Whether superheater water-cooling was the right method or not had yet to be proved, but he was not aware that any harm was being done by injecting water of a lower concentration than that of the steam. Independent superheaters of recuperative designs would provide an efficiency of 80 per cent. or even more.

Street Lighting in Ireland

THE paper by Mr. F. X. Algar which was read before the INSTITUTION OF CIVIL ENGINEERS OF IRELAND in Dublin on December 3rd commences with a brief history of those light sources that have been used for the illumination of streets, and describes some of the sources now available. The description of modern equipment is confined to that which is electrical, since electricity is the principal medium used for lighting streets in the Irish Free State.

During the last completed year the total expenditure on street lighting in the Irish Free State, including new work, was approximately £120,000, or, roughly, an average of 9.6d. per head of the population. Of this expenditure, about 76 per cent. was in connection with electric lighting. The approximate total number of electric lamps in operation was 17,500, of which about 70 per cent. were lighted, maintained and operated by the Electricity Supply Board. Excluding the lamps in certain sections of Dublin, and isolated lamps elsewhere, all the lamps completely controlled by the Board were supplied and erected by the Board under contract. Altogether the Board holds 185 contracts for street lighting with the responsible local authorities.

Outside Dublin and Cork, the installations are largely of a standard plan carried out with standardised material. Two types of fitting are used, termed Class I and Class II for convenience; both give symmetrical distribution. The Class II type is the more generally used. These fittings are usually erected on network standards at a height of 18 ft. above ground level. In main streets a lamp of not less than 200 W is erected on the average every 40 yds.; in secondary streets 200-W lamps are spaced 80 yds. apart, while in less important thoroughfares the same lamp is erected at intervals approximating to 120 yds. In lanes 100-W lamps are placed as required.

A notable exception to the general rule in standard installations is the City of Limerick, where an average spacing of 40 yds. holds good for practically the entire city, and while the size mainly used is 200 W, considerable use is made of 300 and 500 W units. Dun Laoghaire (Kingstown) is also an exception in that the lamps used are almost exclusively 300 W. There is a small number of 500-W units and a still smaller number of 200-W units. The spacing of units in this case, however, is greater than the average elsewhere. Waterford, Bray, Galway, and Dundalk also make use of 500-W lamps to some extent in the main streets.

In Cork City an attempt has been made to design a lighting installation for the city as a whole, with a fair measure of success. The units are graded from 1,000 W each in the central area, through 750, 500 and 300 W in the secondary areas, to 200 W on the outskirts of the city. The heights of the units above ground level, and their spacings, vary according to the type of thoroughfare concerned and the method of mounting used. All the usual methods of mounting have been utilised, and, in addition, an approximation to central suspension has been obtained by the use of old tramway trolley arms as brackets attached to steel poles on the kerb.

In the central area suspension from span wires attached to buildings has been used almost exclusively. The fittings are of three types: (*a*) dome reflector enclosed in a vitreous enamel sheet steel housing, with an opalescent diffusing globe; (*b*) enamelled metal reflector with cast iron canopy and a ring-shaped opal glass shade; and (*c*) dispersive type enamelled metal reflector without any glassware.

In any particular street or length of thoroughfare only one type of fitting is installed; all the fittings used give a symmetrical distribution and there is extensive use of diffusing

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Better Demonstrators

The letter in your issue of December 7th from Mrs. Dyson Rayner contains the following paragraphs:—

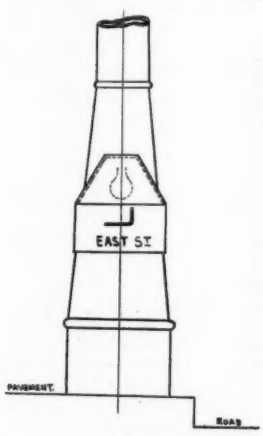
(A) "I really believe that the reason so many householders retain their gas cookers, in spite of changing over to electrical appliances for most other domestic uses, is that they can see the flame which provides the heat."

(B) "The enclosed-type boiling plate on the electrical cooker, which appears to be the best fool-proof type on the market, does not provide *visible* heat, and it takes a demonstrator with tact and patience, not necessarily degrees, to convince the housewife that it will do all, if not more, than her gas-burner."

I quite agree with paragraph (A) but I certainly do not agree with paragraph (B), as the modern transformer-operated open type boiling plate is even more fool-proof in every respect than a gas ring, and *does* provide visible heat. If Mrs. Rayner has never used one of these her education in electric cooking is certainly incomplete. The only drawback is the additional first cost due to the transformer, but this is recouped many times over in the saving of maintenance costs. The plate gives higher efficiency with *ordinary* cooking utensils (which the great majority of housewives will persist in using), and complete satisfaction to the housewife. It cannot, of course, be used on a d.c. supply. ARCH. J. HOWARD.

Taunton, *December 8th.*

Fog Lights



Your readers may be interested in the accompanying illustration showing one method of making the roads safer during foggy weather.

The lamp is attached to any existing lamp or tramway standard. The inside of the casting is finished in white porcelain, which reflects the light on the curb, and gives the name of the street turning, or any other instruction, such as "turn left."

If this device was installed in our big cities and towns, the buses and trams need not run a "skeleton" service.

December 5th. A. W. B.

Liability for Consumers' Apparatus

In your last issue Mr. Watkins implies that manufacturers and contractors alike should earth appliances and use three-pin plugs. Earthing does not remove liability. This is a legal question and can only be settled according to the circumstances surrounding the case at the time the fault occurred.

The electrical industry is more concerned with making apparatus as safe as possible; it is not sufficient to earth apparatus and rest content. If Mr. Watkins's ideas were generally adopted then all lamp-holders would have three points to enable them to take domestic appliances as well as lamps; this would entirely disorganise the lamp industry and make existing installations unsound.

Again, a third wire means further risk, for a badly earthed appliance is a greater danger than a poorly insulated one. To-day many manufacturers of cable market a complete non-kinkable two-core flex fitted with plug or adaptor, and it would be far better for appliance manufacturers to use these standard articles from reputable firms than to buy separate lamp adaptors, plugs, &c., and try to convert them into three-core circuits in the extremely small connecting space which is generally available.

The real solution is *insulation*, not earthing. If manufacturers paid more attention to the use of only first-class insulation, less trouble would occur. If only authority would step in and make it compulsory for all accessories to be tested and approved and stamped, as in Germany, there would be fewer accidents.

Finally, your correspondent is, I see, associated with the wireless trade. It is in this direction that my remarks particularly apply. A close examination of many mains receivers will reveal cheap flex and adaptors, and, worse still, a step-up transformer, increasing voltage well above the mains pressure without any provision for cutting off the current, should the set be opened—a familiar habit of wireless set owners.

December 10th. H. S. COLLARD.

The E.D.A. Films

I have read in your current issue the letter under this heading written by "the engineer of a respectably-sized undertaking" and signed "Food for Thought."

As this engineer was present at the pre-view of these films in Leeds I assume his undertaking is situated in the Mid-East England Area of the Association, that it is a member of the Association, and that he is his undertaking's representative.

In deciding to utilise films as a medium for publicity the Council of the Association was breaking new ground, not only in connection with the electricity supply industry but to a large extent in connection with industries in general. Having, therefore, little or no experience of its own to assist it in its task, it utilised the services and gave consideration to the advice of firms and persons who have been successful for a number of years past in producing films which have met with the approbation of the public. The Council and officials of the Association knew the type of propaganda which it was desired should be put over by means of the films, but gave credit to the film producers for knowing best what kind of story incorporating that propaganda would appeal to the public; therefore, the stories upon which the films are based and the production of the films were left in the hands of these experts, and not until the pre-view in London did the Council see the result of the producers' efforts.

It is not to be expected that any film will please everybody, especially films which had to be produced in such circumstances. In so far as the members of the electricity supply industry are concerned, I have heard the comments of many of them on the subject of these films. One gentleman, whose opinion is of great importance to the Association, stated that, though certain minor criticisms might be offered, on the whole he considered the films to be very good, particularly having regard to the difficulty of producing films on such a subject. On the other hand, another gentleman, representing a member which is a large subscriber to the Association's funds, appeared to be anything but pleased with the films. Between these two opinions the views of others to whom I have spoken vary considerably. However, the only real test as to whether the films are satisfactory or otherwise is to ascertain how they are received by the public for whom they were designed, which test has not yet been made.

Your correspondent is evidently greatly dissatisfied with the Association's effort, but I would suggest to him as still further "Food for Thought" that he, as the representative of a member of the Association, has adopted a wrong method of giving expression to his dissatisfaction. The constitution of E.D.A. is a very democratic one, and full advantage has been taken of this in the Mid-East England Area, every member of the Association in which has a representative on the Area Committee. The ordinary meetings of this Committee are held twice a year, and, while the last meeting took place a week or so before the films were shown in London and in normal circumstances the next meeting will not take place for some months, it would have been possible to arrange for a special meeting to discuss the question of the films if your correspondent had shown to the Area Executive Committee that such a meeting was desirable or, otherwise, have found nine other representatives of members in the Area who wished such a meeting to be called, and notified the Area Officer accordingly.

In suggesting this procedure I am assuming that your correspondent is not a member of the Area Executive Committee.

Street Lighting in Ireland *(continued from previous page)*

glassware. Work on the installation is still proceeding, and will not be completed until early in 1936, when it is expected that approximately 1,400 lamps will be in operation in the city.

The City of Dublin has the largest public lighting installation in the country. It comprises approximately 5,500 electric lamps and 3,650 gas lamps, but in general the lighting of the city is not all that could be desired. The reasons for this are many and are chiefly financial. The complete abolition of old installations and their replacement by modern equipment is now the endeavour of the Corporation. The public lighting of the city is controlled by an engineer specially appointed to the work in the city engineer's department; he is the only holder of such an office in the country.

which he must be if his undertaking subscribes more than £100 a year to the Association's funds. Moreover, he might be on this Committee if his undertaking does not subscribe such an amount; if he is not, it is either because he was not nominated at the last election or, if he was nominated, the members in his particular group preferred the services of others than himself on the Executive Committtee. The latter meets regularly every month and has, as a matter of fact, a meeting this week at which your correspondent, if a member, might have ventilated his views or before which, if not a member, he could have appeared for the same purpose.

Having regard, however, to the *esprit de corps* and the regard for the Association's prestige shown by the members of the Executive Committee, it would surprise me to learn that any one of them had caused such a letter as that appearing in your columns to be published. Criticism of the Council's efforts by members of the Association is expected and is welcomed, as such criticism shows that members have an interest in the Association's doings, and as a result of criticism improvements can oft-times be effected and new methods be introduced. I would, however, submit that criticism on the part of members should be put forward at meetings of the Association and not, except in very exceptional circumstances after failure to obtain satisfaction at meetings, in the columns of the Press.

As your correspondent has preferred to utilise the Press rather than his privileges as the representative of a member of the Association, I would suggest that he writes to you again giving further particulars, including his name and that of the undertaking with which he is connected, so that all who have read his letter may be furnished with the opportunity of appraising the value of his criticisms in the light of the subscription paid by his undertaking to E.D.A. and his own status and past experience, more especially in regard to the reactions of film audiences, and to the help he has given to the electricity supply industry in general and to E.D.A. in particular.

THOS. ROLES,
Chairman of the Mid-East England
Bradford, *December 10th.* Area Committee of E.D.A.

Earth Leakage Protection

I have read with great interest the communication from Messrs. Pickles and Ross in your issue of December 7th, describing their method used to protect sub-station gear and the lines emanating therefrom against leakage where earthing is more or less difficult. I feel bound to point out, however, that this method is in extensive use abroad, and was first described in this country, so far as I know, in my book "Artificial Earthing for Electrical Installations," published nearly three years ago. The actual illustration used on that occasion is reproduced herewith, showing the sub-station switch and one earth-leakage switch on a consumer's installation.

The Continental device appears to incorporate one or two features overlooked, or at least not mentioned, by Messrs. Pickles and Ross, to which I should like to draw their attention. For instance, it is well known that the short circuit between phase and neutral at the remote end of an overhead line is usually difficult to isolate, the ohmic resistance of the line preventing this. The German switch therefore incorporates a thermal trip in the neutral, rated at about one-fifth of the phase trips, which ensures isolation in these circumstances.

All overload trips in this switch are of the thermal type, backed with a rapid electrostatic trip, but the leakage trip is of the magnetic type. Even so, its action is slightly delayed, by having to operate through a series of balance weights and loading springs; this is for the reason that it is not desired that transient potentials of short duration shall trip the switch and unnecessarily interrupt the supply.

This switch, which is manufactured in capacities up to 350 A at 500 V, also has numbered dials that move one point each time the switch trips; an engineer can then always discover for what reason the switch is out, as a numbered dial is fitted to each phase overload trip, the neutral overload trip, and the leakage trip—five in all. The thermal releases are adjustable within their ratings, and are interchangeable, ranging from 30 to 350 A; the leakage trip with balance weights can be seen on the extreme right of the accompanying photograph. The neutral line is never broken, needless to say, nor is it ever disconnected from the main earth; the artificial earth is disconnected, however, when the switch is open.

I am delighted to hear that Messrs. Pickles and Ross are finding this method of protection of such great use, as I was told over and over again when first introducing this method that it would result in too many "outages" and would never be suitable for use in this country. Following practical experience with the system, however, rural engineers will find that some such form of protection is essential in their districts, and I have no doubt that it will become as popular here as it is abroad.

T. C. GILBERT.
Folkestone, *December 8th.*

The letter from Messrs. J. S. Pickles and D. Ross in your issue of December 7th is certainly one which should make all engineers, apart from those engaged in rural electrification, sit up and take notice.

The repeated and by no means infrequent endeavours to secure the required low earthing circuit resistance, in spite of almost overwhelming odds, make such procedures appear ludicrous; and, indeed, they surely must be, when the alternative method—better from the standpoints of both cost and efficiency—of employing an earth leakage trip could be utilised with great advantage.

Another point, too, against a solid earth obtained with difficulty is that it needs to be nursed and carefully regarded in the light of varying conditions, in order to ensure efficacy when the crisis should arise. Not so with the circuit protected by the earth leakage trip, however, for, high and variable resistances have little or, at least, no appreciable detrimental effect.

There is, moreover, every reason why an automatic circuit-breaker embodying an earth leakage trip should be included where the possibility exists of apparatus becoming dangerously live, through defects. And another extremely important thought also is to regard as an essential part of the power engineer's equipment an earth tester of the type which provides an accurate indication of the true resistance to earth of the buried plate, driven rod or electrode; a "conscience-satisfying" earthing circuit is not nearly good enough.

Your correspondents' reference to results of actual operating conditions confirm those obtained from the exceedingly drastic tests carried out by myself which were reported in the ELECTRICAL REVIEW of July 21st, 1933. S. H. PARSONAGE.
London, N.W.9, *December 10th.*

Commutator Mica

In your issue of November 30th Lieut. S. Osborne condemns the practice of undercutting commutator mica. From personal experience, however, I have found this procedure to be very necessary to overcome excessive brush wear and chatter, due to the fact that on the majority of motors the copper wears down much faster than the mica. One machine under my care wore out a set of brushes per week until the mica was undercut, when the trouble completely disappeared.

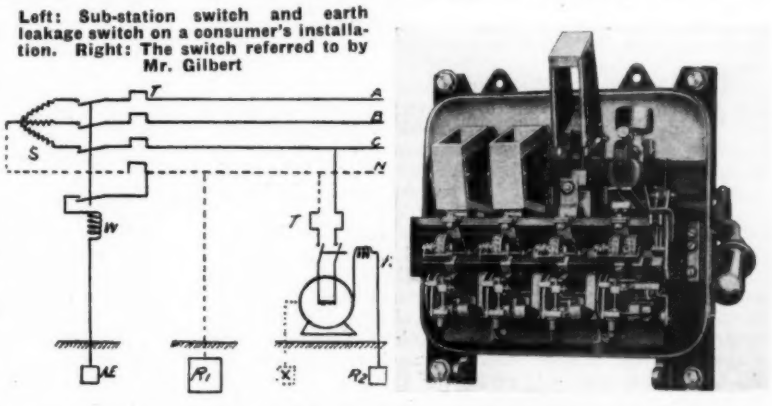
If the motor is not severely overloaded and the correct grade of brush is used the troubles mentioned should not occur.

December 5th. MAINTENANCE ENGINEER.

When maintenance engineers refer to high mica as a non-existent bogey, it makes one wonder how they have missed it in twenty years. As a motor maintenance man of over twenty years' experience with d.c. motors, having some 200-300 motors to maintain and keep running mostly on 24-hour service, I can assure Lieut. Osborne that high mica can be a real bogey (when one hasn't the time to trot around with glass paper and bed-in brushes).

The cure is to undercut, although commutators should never be undercut indiscriminately, as some motors do not require it; it depends entirely on the make, type of brush gear, and grade of brushes used. Some makers use micanite and this usually wears down with the copper, but the maintenance engineer can usually tell at a glance exactly what his machines

Left: Sub-station switch and earth leakage switch on a consumer's installation. Right: The switch referred to by Mr. Gilbert



require, and, without keeping a log, knows by his brush stock and breakdowns which pays. GEORGE E. CHALK.

London, N.18, *December 6th.*

I agree with Lieut. Osborne that mica undercutting is a bogey. I have had under my care for the past four years over 200 d.c. motors, ranging from ¼ to 60 h.p., all of varying speeds. After having rewinds of armatures, and new mica segments in commutators at the rate of one per month in the first two years, I decided to run all motors with flush mica, and when armatures were taken out, some had to be turned to bring up the micas before grinding on their journals. Since adopting this, I have not had a burn-out, or any commutator trouble.

In my opinion, the undercutting of micas without individual attention, is splendid for rewinds, and not too bad for brush suppliers. So far, I am waiting for the mica ridge to make itself apparent, and, if it does, it will be dealt with without the delay and expense of a rewind.

New Malden, Surrey, *December 10th.* EDWD. W. MORRIS.

It can be said that the modern practice of undercutting mica on commutators on most modern machines is a sheer necessity and far from being the avoidance of non-existent bogeys. There are machines which work quite satisfactorily with, or even necessitate, flush mica, but others definitely require undercut mica. In the fractional h.p. types the whole question is still controversial, partly on account of brush noise with undercut mica, and partly on account of the cost of the under-cutting in manufacturing. I also omit single- and multi-phase a.c. commutator machines.

I suggest that the classes of motors with which Lieut. Osborne is concerned are non-interpole machines with copper gauze brushes and non-interpole machines with carbon brushes, having a hardness of 70-90, or perhaps somewhat softer, with a small per.entage of abrasive. With brush current density not greater than 30 A per sq. in. and large interpolar space and consequent wide commutating zones, *i.e.*, the easy machine ratings of the pre-interpole era, and with a certain amount of attention these machines may work well even with soft graphite brushes. These machines are pre-war. The flush mica habit naturally encroached on the interpole design, there being no sharp change-over partly due to the slow development of the modern high performance grades of brushes.

Undercutting is necessary in the modern high-rated interpole machine dating from about 1906, but particularly in post-war types with brush current densities of about 50-60 A per sq. in. and commutator peripheral speeds of 3,000-7,000 ft. per min., *i.e.*, generators, rotary convertors, motor convertors, traction, crane, and mill reversing motors, and the general run of industrial machines operating at or near full load and overload.

I venture to suggest that the question arises out of the phenomena encountered in current collection on commutators, *i.e.*, commutator erosion brought about by the collective effect of mechanical abrasion of the brushes, current flow from commutator to brush, and circulating currents under the brush dependent on the state of machine commutation. There is little doubt that to ensure reliability of service under modern conditions, with fully loaded machines, undercut mica is necessary.

With flush mica the selection of a brush is generally limited to a few hard carbon grades; though very special maintenance may enable the non-abrasive grades, having excellent commutating and collecting properties, such as the graphite and electro-graphitic types, to be used. To run machines satisfactorily, such maintenance is, however, very nearly impracticable.

The question of copper picking, ring fire, excessive dust, wear, and brush-chatter on undercut mica, opens up a further field of discussion which is certainly still with us to a large extent. These points can be taken care of to a large degree by the selection of a suitable brush and by paying attention to the mechanical stability of the brush on the commutator. I agree that the 15 deg. "trailing" angle suggested by Mr. Trickett is a very suitable arrangement, but I am personally in favour of the 30-35 deg. reaction angle with a specially designed holder to ensure the greatest degree of brush stability.

London, N.W.9, *December 10th.*

A. H. UHL,
SYNTHETIC CARBON & ENG. CO. LTD.

"The Battle of the Systems"

Our attention has been drawn to the article "The Battle of the Systems" appearing in the issue of the ELECTRICAL REVIEW of December 7th, under the name of Mr. F. J. Phillips.

May we be permitted to point out to Mr. Phillips that the paper to which he refers was prepared for discussion at meetings of the I.E.E. by the members of the I.E.E. and also by their friends who are specially interested in and qualified to speak on the subject. Ten such meetings have been arranged by the I.E.E. in various parts of Great Britain and Ireland for the purpose of providing reasonably adequate facilities for the discussion of the paper by the members. Also, we understand that an invitation has been extended to the Institution of Heating and Ventilating Engineers in order that all parts of the paper may be thoroughly examined by the acknowledged experts in each of the sections discussed in the paper.

In the circumstances, therefore, we experience some little difficulty in assigning a satisfactory reason for the somewhat unorthodox procedure that Mr. Phillips has considered necessary to adopt in order to ventilate his own views on the subject, and we see no good and sufficient cause to depart from the well-established precedent of replying to the official discussion in the I.E.E. *Journal* at the appropriate time.

London, W.C.1., *December 11th.* R. GRIERSON.
D. BETTS.

In his article in your issue last week Mr. F. J. Phillips assumes that Mr. R. Grierson is now an enthusiast for the thermal storage boiler method of warming buildings electrically, and then takes him severely to task for not having discovered the merits of this system in 1931. As a matter of fact there is nothing in Mr. Grierson's paper to support the perfectly gratuitous assumption made by Mr. Phillips.

Mr. Grierson's paper is entitled "A critical examination of the present practice relating to the electrical warming and air-conditioning of . . . the larger buildings" and because he has seen fit to analyse the thermal storage method in greater detail than hitherto, Mr. Phillips chooses to regard him as a convert.

Whatever view is taken of the subject matter of Mr. Grierson's paper there can be no doubt that he is an assiduous student of a very important field of electrical development, and one is accordingly disposed to inquire whether Mr. Phillips's article is, to say the least, either fair or in good taste. J. LESSER.

London, E.C.1, *December 11th.*

Electrical Accidents

The study of recent statistics submitted by Mr. J. B. Harris is arresting and of considerable interest and value, enabling many deductions to be made and many lessons to be learned. Those authorities who have placed safety first still continue to supply direct current and authoritatively claim for their consumers immunity from fatal shock.

Confirmation of this claim is furnished by the figures for 1931-32 showing fifteen fatalities by alternating current at voltages below 250, whilst during the same period there was a complete absence of fatality arising from the use of d.c. at similar voltage. If further proof is needed, take the figures submitted for the four years 1922-1925; although there were 688 accidents on d.c. circuits only three of these proved fatal, whilst for the same period there were 399 accidents on a.c. circuits, fifty-two of which proved fatal; evidence enough surely to demonstrate the safety of d.c.

A case having considerable bearing on this subject was brought to my notice the other day. A district in Bengal was originally supplied with a.c. at standard voltage, but owing to the number of fatalities in the native quarters it was decided to discard a.c. and substitute therefor a d.c. system at lower voltage, and since the alteration has been made, I believe, no fatality has been recorded. C. S. DAVIDSON.

Barnes, *December 11th.* *Borough Electrical Engineer.*

Wanted—A New Unit

In their recent I.E.E. paper Messrs. Grierson and Betts make a valiant attempt to induce us to change our method of pricing electrical energy. Briefly, the suggestion is that kWh shall be quoted at so many to the pound sterling rather than so much apiece. This avoids troublesome fractions of a penny, and enables quite small price changes to be made without departing from round numbers. It also short-circuits our non-decimal coinage and gives a heating cost directly in pounds.

Innovators and prophets are notoriously ill-treated, and one hesitates to do anything to discourage them. The authors of this paper are known as men of great faith, such as can remove mountains, but in the present case the mountain is only one of a large range. The moment one peak is surmounted half a dozen others come into view. Supposing that we become converted to the new method and agree to quote so many kWh to the £, what shall we do when we come to a two-part tariff? Shall the one part be quoted at so many £ to the unit (kW) and the other part at so many units (kWh) to the £? The double tariff is like the Siamese twins in any case, and it does not improve matters if one of the twins is upside down!

In fact, this suggestion has the effect which many Utopias have upon the reader—that of making him feel that the present is not such a bad world after all. The existing method is at least not an inverted one; the figure does not go *up* when the price goes *down*. The method is in line with that used for almost all other supplies and commodities. The chances of a change are faint indeed, even were the advantages of changing much greater than they are. The question is—Can we find some other way out of the undoubted difficulties of the present system?

I do not claim the idea as new, but I suggest that we should quote on the basis of a unit of 10 kWh instead of one. The change is a small one—merely the shifting of a decimal point—and any legal difficulties could be overcome by quoting the same number, as a decimal per kWh, in brackets after the other. The great thing is to find a name for the new unit, since advertisers and psychologists join in telling us that until a thing has a name it can have no real existence, at least in the popular mind.

Until a suitable name is found for it this new quantity might be called a " big unit " to avoid confusion with its small brother, but once named it would soon establish its new identity and take its rightful place as a really useful electrical unit.

Consider the present difficulties of an electricity committee in dealing with an " all-in " tariff having a secondary rate of, say, ¾d. per kWh and wishing to reduce this rate somewhat. A reduction to ½d. would be far too great, whilst a reduction to 11/16ths, 5/8ths, or 9/16ths of a penny involves fractions that may be not inappropriately described as vulgar. Alternatively the rendering of the electricity accounts may be followed by indignant queries as to what is meant by 0.6 or 0.7.

How much simpler if the present price had been 7½d. a big unit, so that it could be reduced to 7d., 6d., or what you will. Between the prices of ¾d. and ½d. per kWh we can change the price per big unit in five separate stages without invoking anything more unfamiliar than a halfpenny. There is no need then to invert the charge and quote 600 kWh for £1, or even 0.4d. per kWh, for we can merely say 4d. a big unit.

In gas supply the therm (100,000 B.Th.u.) has proved itself a convenient size of unit, which can be priced in pence without involving either very large numbers or very small fractions. The new electrical unit (34,150 B.Th.u.) would be only one-third as big an input unit, but for many purposes the output obtainable therefrom would not be very different. At all events it would be of the same order of magnitude as the therm, and would share its advantages as regards convenience of reckoning and price changes.

Finally the " big unit " would not supersede the kilowatt-hour or make it any more difficult to use the latter in any case for which it was more suited. Being in a simple ten to one ratio there would be no difficulty in converting one unit to the other, and a price that looked high in the one form could always be expressed in the other unit. Just as when fruit is dear the coster's barrow displays very prominently the price of *half* a pound, so a high lighting rate could always be expressed as 6d. a kilowatt-hour rather than 5s. a big unit which would be rather alarming.

London, S.W.1, *December 7th.* D. J. BOLTON.

Lift Control

In his article on " The a.c. Lift Controller " which appeared in your issue of November 30th, Mr. W. Woodiwiss states " that it is now standard practice to fit rectifiers with a.c. lift control circuits." He gives as the reason that d.c. contactors give an even and not a pulsating pressure. This seems altogether too far fetched since with properly designed a.c. magnets there is practically no hum, far less rattle, and consequently there can be no pulsating pressure at the contacts. Even if one were to assume a serious hum, then the rise and fall of contact pressure would not be measurable on the contacts. Nearly all well-known makes of a.c. contactors allow a " follow-up " of the thickness of the contact, if non-adjustable. The initial spring pressure on the average will be around 60 to 70 per cent. of the final pressure. He also states that d.c. contactors are preferable since they do not take an increased current in the coil should the magnet fail to go right home.

Surely it is fundamental that even on d.c. contactors the magnet must close fully to break the weld at the contacts. Mr. Woodiwiss does not say whether more burning and consequent wear takes place on the auxiliary contacts due to their breaking inductive d.c. circuits, nor does he state that high voltage discharges exist in d.c. operation, making it necessary to take special care with the insulation of auxiliary switches, &c. The diagram shows that the brake coil is also energised from the d.c. side of the rectifier. Surely an a.c. brake is much speedier in operation than a d.c. one. One can therefore anticipate more wear on the brake shoe linings when d.c. operated, particularly if there is a drop in volts.

In my opinion there are more complaints regarding the banging home of contactor magnets than the hum. This is equally applicable to a.c. or d.c. operated contactors. The correct starting gear for a lift is undoubtedly a camshaft motor-driven contactor unit with the brake operated mechanically by the camshaft through a collapsible toggle mechanism. Very light acting selector relays could be employed to control the motor.

Under " Maintenance of the Controller " the author states that the contact tips should be re-faced if " pitted." Surely it is now established that the arcs produce a very hard wearing skin on the copper, and while " blobs " should be removed it is most unwise to re-face tips by filing even when they appear to be " pitted." In any case, on properly designed contactors the contacts " roll " and " wipe " when closing and therefore finally rest on a clean spot away from the actual arcing surfaces.

Bradford, *December 5th.* G. O. MACMILLAN.

Papers at the Radiological Congress

AMONG the physical and technical papers read at the annual Congress of the BRITISH INSTITUTE OF RADIOLOGY in London on December 5th to 7th was one by Dr. A. Muller and Dr. R. E. Clay on " X-ray Plant at the Davy-Faraday Laboratory," in which the authors showed that, for any given target material, the maximum permissible load depended on the square root of the area of the focal spot, so that with a stationary anode the power could only be materially increased by enlarging the focus to an extent not permissible for many purposes.

An alternative method of increasing the power was to use a rotating anode, thereby distributing the heat over a considerable area while yet retaining a fine focus. Sealed-off X-ray tubes built on this principle had been used for medical purposes for some time, and Dr. Muller and his colleagues had constructed a demountable tube capable of handling 450 mA at 35 kV. The anode, which was about 20 in. in diameter, was rotated by a motor through a belt drive at a speed of 2,000 r.p.m. The whole tube was exhausted by vacuum pumps of the oil diffusion type, and an ingenious device was employed to overcome the otherwise inevitable leak of air through the shaft bearing.

The designs for a tube of 50 kW were being considered, but the authors did not think it possible to increase the power much beyond this figure, since the maximum loading only varied as the square root of the peripheral velocity, and the stresses set up in the rotating anode of a tube rated at, say, 100 kW would approach the ultimate strength of the target material.

The fifteenth Mackenzie-Davidson memorial lecture was delivered by Sir William Bragg on " X-rays and the Coarse Structure of Materials." The lecture was mainly devoted to an exposition of recent work on organic compounds having ring structures and to researches into the strength of materials considered from the atomic point of view. The lecturer explained how, by means of X-rays, curves representing the electron density in complex crystals could be obtained, and showed that such curves indicated a molecular structure agreeing very closely with that pictured by organic chemists. The spacing between the carbon atoms of the rings was dependent on the bonding, but was of the order of one or two Angstrom units (*i.e.*, about 10^{-8} cm.).

From a knowledge of the interatomic distances and the electronic charge, it was possible to calculate values for the tensile strength of materials. Similar calculations could also be made from chemical considerations, and the two methods gave results in good agreement with one another, but much higher than those usually obtained experimentally. The discrepancy might be accounted for by assuming that microscopic cracks appeared in practical specimens, and recent experimental work carried out under conditions in which superficial cracks were not strained gave values for tensile strengths in good agreement with calculated values.

It was also shown that the mechanical properties of materials were changed by vacuum treatment. For example, if a piece of mica were cleaved in vacuum the cleaved portions would reunite when brought into contact again, although if the same experiment were performed in air the cleavage would be permanent. This effect might readily be explained by assuming that, in air, the mica surfaces rapidly absorbed a layer of water vapour which reduced the electric fields to such an extent that cohesion was not possible, whereas in a vacuum water vapour did not deposit and the electric forces remained substantially unchanged.

New Apparatus and Devices

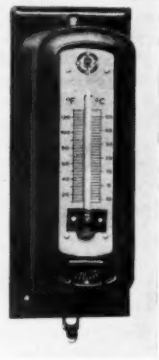
for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Room Temperature Control

The "Pilostat" thermostatic relay-type switch is designed to operate within a differential of + or − ½ deg. F. As it is unaffected by angular deflections up to 20 deg., the switch can be used for traction and marine work. The thermostatic element is a capsule containing volatile liquid which actuates the pilot switch arm without intermediate magnifying levers; magnetically controlled snap action is provided for the silver contacts.

A pressed brass wall plate is fixed to a standard B.S.S. wall box, three wires being connected to conveniently arranged terminals at the back of the moulded bakelite switch base, which carries the thermostat and relays with interconnections. The bronzed cover is hooked over the top fastening leg of the base and fixed at the lower end by concealed screws so that it cannot be removed by unauthorised persons.

All exposed metal parts are earthed. A thermometer on the front of the cover gives a finished appearance and a large graduated setting scale moves behind a window in the cover, the setting temperature being indicated by a pointer formed integral with the cover projecting into the scale opening. It is unnecessary to remove the cover when connecting the switch to mains and load.

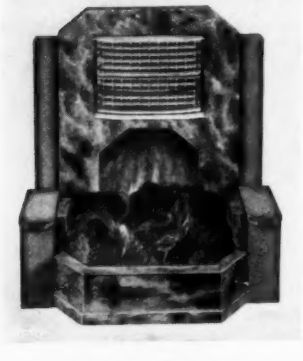


The Drayton "Pilostat"

The same switch can be used for 100/120 V d.c. and 200/250 V a.c., 50 cycles. For 220 V d.c. a resistance is embodied in the relay coil circuit without adding to the dimensions. The thermostat itself controls only 5 W as a maximum. The prices of the switch, which is made by the DRAYTON REGULATOR & INSTRUMENT CO., LTD., West Drayton, are, 15 A, £3 10s.; 20 A, £3 15s., and 25 A, £4.

An Imitation Coal Fire

The accompanying illustration shows the imitation coal fire which has been developed by FIRENHEAT, LTD., 7, Buckingham Street, Strand, London, W.C.2. This model, which is known as the "Eclipse," is priced at £3 16s. 6d. Glass silk is the basis of the fuel, which is easily removable, while a specially arranged reflector situated behind a painted metal gauze gives the effect of sparks and smoke rising up the imitation flue. Spot welded construction is employed throughout. Two 1-kW "Magnet" elements are incorporated. The weight is 25 lb. and the fire's measurements are 23 in. high by 19 in. wide.



The "Eclipse" fire

Modern Pendant Fittings

Three of the new fittings introduced by HARCOURTS, LTD., 21A, Newman Street, Oxford Street, London, W.1, are illustrated below. The single-light bracket known as the "Abingdon" is so constructed that any number of panels can be used to build up larger fittings similar in general design to the "Kilgetty" pendant.

The panels are of special moulded glass tinted "neutratone," which is intended to harmonise with practically any decorative scheme, and either chain or rod suspension is available. The "Faversham" type of fitting is available in several shapes, also with three or five lights. It can be obtained sprayed in any colour to match decorations, or in natural bronze or chromium-plate.

The "Faversham," "Abingdon," and "Kilgetty" fittings

A Small Cabinet Refrigerator

H.M.V. HOUSEHOLD APPLIANCES, LTD., 363, Oxford Street, London, W.1, whose cheapest refrigerator has hitherto been priced at 40 guineas, have just placed on the market a 25 guinea model of the, as yet, uncommon chest type. The new refrigerator is the "Model 20," and has exactly the same silent circulating mechanism as that fitted to the more expensive models, but instead of having a door opening outwards, the food is placed into and withdrawn from the top of the cabinet.

The new refrigerator has a shelf area of 5 sq. ft., and a food storage capacity of 2 cu. ft., but food can be packed more closely than in the conventional form, as the circulation is better. A basket shelf and sliding shelves are provided for storing vegetables and meat, whilst the two ice trays have a total capacity of 36 cubes, weighing 2¼ lb., and as each tray rests on a section of the cooling unit ice can be made in under an hour on a normal setting. There is ample bottle storage space. The interior and top are finished in porcelain, whilst the sides are cellulosed in white. A nine point regulator is provided for the cooling unit. The overall dimensions of this refrigerator are 36 in. high by 22¼ in. wide by 19¾ in. deep.

The new H.M.V. refrigerator

A Capacity-operated Switch

Last week we witnessed a demonstration of the new "Humaswitch" at the offices of HUMAN SWITCH, LTD., Eagle House, Jermyn Street, London, S.W.1. This apparatus has been designed mainly for use in shops, where, it is suggested, a notice should be displayed: "This window lights on your approach." No light-sensitive cell is employed as the apparatus relies for its operation upon the "body capacity" of the person approaching.

A thin wire or aerial is extended underneath the window inside the shop, and the added capacity of the passer-by upsets the balance and so actuates a relay, which, in turn, operates the main switch. The apparatus can be adjusted to have a sensitivity of from a few inches up to 25 or 30 ft.

To act as a burglar alarm for safes the apparatus can be arranged to work off batteries; the buzzer rings as soon as anyone approaches the safe, and, since the entire apparatus is self-contained and inside the safe, the buzzer cannot be turned off until the safe door has been opened. The alarm will operate, of course, even when the approaching person is on the other side of a wall. The price is 35 gns., but it may be rented for 30s. per month; although it has been designed mainly for shop-window lighting and burglar alarms, its use can easily be extended to include the switching of fires, the opening of doors in restaurants and hotels, the operation of escalators, &c.

A Small Battery Charger

The "Midget" battery charger is a new development by the ELECTRO DYNAMIC CONSTRUCTION CO., LTD., Devonshire Grove, London, S.E.15, for conditions that do not justify the installation of a large plant, such as in small radio shops and garages. At a price of 4 gns., it is also within reach of the owner of a small car who can carry on battery charging in his private garage. Provision is made for inputs at 50, 100, or 200/250 V d.c., giving an output of 20 W at 5, 7.5, 15 or 30 V. It measures 6 in. by 5 in. by 13¾ in. and weighs 7 lb.

The "Midget" battery charger

Marketing Electric Vehicles. By J. F. Amor

Suggestions for a co-operative effort

AFTER lengthy deliberations the Electric Vehicle Committee has decided that there is a large market in this country for electric vehicles. This is not news by any means to many people in the electrical industry for it has been apparent for some years that there was an immense field simply waiting for exploitation.

Those who know the capabilities of electric vehicles must have watched the process of delivering bread, milk or other household commodities and the house-to-house collection of domestic refuse by horse-drawn floats or motor vans and wondered why no serious attempt had been made to popularise electric vehicles in this country for such services.

After all in its particular sphere the electric vehicle has no need to fear competition from any other quarter, for all the advantages are overwhelmingly on its side. It is economical, noiseless, clean, simple to operate, and above all supremely efficient, thus possessing all the desiderata for town service. The field is certainly limited but nevertheless of sufficiently large dimensions to justify the serious consideration of the whole electrical industry in providing a market for manufacturers as well as a useful "off-peak" load for supply authorities.

Mr. J. F. Amor

The Electric Vehicle Committee estimates a potential demand of 100,000 vehicles during the next ten years which will increase the load of the various supply authorities by 400 million kWh per annum, bringing in an additional annual revenue of £800,000 to them for the supply of charging current. Even if we presume the figures to be on the optimistic side the market still remains a desirable one and obviously worth a serious effort to change it from a possible prospect into concrete business.

Whilst it is true that some efforts have been made by a few enthusiasts it cannot be denied that the vehicle market in general has so far been handled with a conspicuous lack of enterprise on the part of the electrical industry as a whole. It may be pointed out that until recently charging facilities were not always easily available but even so there were areas where conditions were favourable to a much more extensive use of electric vehicles than was actually the case. However, it has now been decided that the market is there, that suitable vehicles are available and that they can be sold.

The Need for Aggression

The only problem which now remains is the selling of the vehicles and so far the makers together with the Electric Vehicle Committee have hardly set the country on fire, although it may be unfair to pass judgment on it so early in the day. At the same time past experience leads one to suspect that many vehicle makers having assured themselves that the market exists and that they can produce suitable vehicles may be quite satisfied to wait until the potential customers realise the facts of the case and come round begging for vehicles.

There are many areas where electricity has been sold in spite of the supply authorities but vehicle manufacturers can hardly hope to be in the same happy position, for the competition from the motor manufacturers is bound to be keen and carried on energetically. Obviously the motor manufacturers can teach the electrical industry a great deal and vehicle makers cannot do better than copy some of their methods, particularly in the matter of providing publicity matter in a generous fashion.

The brochure produced by the Electric Vehicle Committee is undoubtedly excellent in its way, but it is not enough by any means, for one has merely to consider the Press advertising and descriptive literature of one single petrol van firm to realise the scale on which publicity must be arranged. In general the electric vehicle manufacturers are following the lead of the motor trade and appointing distributors for different territories, but it remains to be seen whether the distributors will obtain the same measure of support which petrol van makers usually give.

The only way to realise the hopes of selling the 100,000 vehicles for which there is said to be a demand is, to use a much hackneyed phrase, to make the general public "electric vehicle conscious." There is no reason why battery vehicles should not be as usual as the electric tram or the electric train instead of being regarded as novelties as they are at present. The education of the public can easily be accomplished by co-operation among the interested parties but a widespread campaign will be needed to obtain acceptance of the idea that the use of battery vehicles is the normal method for town deliveries of goods.

As a commencement area sub-committees of the Electric Vehicle Committee should be set up consisting of representatives of E.D.A., supply authorities, vehicle distributors, and battery makers. Such committees, with their knowledge of local conditions, would be in a far better position to decide on propaganda methods than a large central committee sitting in London. Moreover, it would include persons actually selling vehicles and who are in close contact with users or potential users.

After all the man on the job is in the best position to know the difficulties, if any, that exist, the customers' reaction to competitors' methods, and what assistance is necessary from other branches of the electrical industry. Local committees would be able to give valuable suggestions on advertising, arrange co-ordination in their areas, and help to make propaganda really effective. There are many other activities which area organisations could carry on; their work would certainly be very helpful to the central body in London, and it appears that the matter is well worth consideration by the Electric Vehicle Committee.

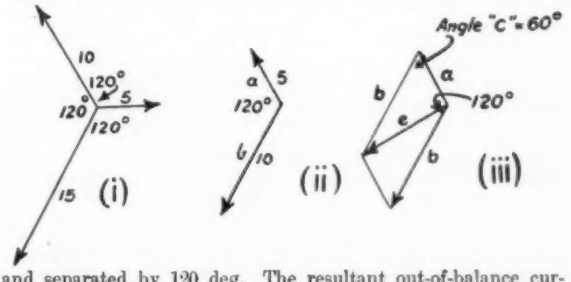
It is indisputable that there is plenty of room for improvement in the marketing methods of the vehicle section of the electrical industry and with a widespread campaign in prospect it can only be hoped that there will be a serious attempt to see the matter in the proper perspective and profit by the experience of other manufacturers who have successfully exploited markets when evidence of their existence was produced.

At the present time the ranks of the electric vehicle makers are not overcrowded, but not so long ago radio set manufacture was confined to comparatively few firms. In the space of a few years we have seen the names of newcomers to the electrical industry become household words in spite of the fact that many of the original firms in the business were well established with adequate finance, large sales staffs, and ample technical and research facilities.

The vehicle market is quite a valuable one and it is certain that history will tend to repeat itself unless those already in the business show that they are quite capable of taking steps to satisfy fully both the demand that now exists as well as that likely to arise within the next few years.

Out-of-balance Currents

TO many, the calculation of the current flowing in the neutral wire of a three-phase four-wire circuit seems a tedious process, but, in fact, where the loads are more or less concentrated, it can be simplified almost to a point of being solved by mental arithmetic. Assume, for instance, that the currents in the outer wires are 15, 10 and 5 A at the point where the loads are connected between the respective phase wires and the neutral as shown in diagram (i). The current of 5 A will balance the other two phase currents to that extent, leaving, as diagram (ii) shows, currents of 10 and 5 A unbalanced



and separated by 120 deg. The resultant out-of-balance current is then the diagonal "C" of the parallelogram shown in diagram (iii). The formula for the solution of the triangle containing the sides a, b, and c is $c^2=a^2+b^2-2ab \cos c$, cos c being, of course, the cosine of the angle opposite to the side c. Now in this particular parallelogram the angle c is always 60 deg. and since cos 60 deg. is 0.5 the formula becomes $c^2=a^2+b^2-ab$, and in the case under consideration therefore the out-of-balance current is $c^2=100+25-50=75 \therefore c=8.66$ amperes.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON December 5th the Committee stage of the Electricity (Supply) Bill was begun. Only one amendment was accepted, and it is apparent that the measure will reach the Statute Book much in its present form.

Sir J. Nall moved an amendment to Clause 1 (arrangements between the Central Electricity Board and authorised undertakers) to ensure that the Commissioners made certain that supplies were not given on unremunerative terms. Mr. H. Williams, who supported this and many other amendments, said that all districts should be treated alike.

Mr. Hore-Belisha pointed out that the Bill provided that the Electricity Commissioners should not give their consent to an arrangement unless they were satisfied that it would not result in financial loss to the Board. The amendment would require that every contract should be lucrative. If Parliament were to trust the Commissioners and the Board, surely it was sufficient to give them the general direction now in the Bill. In view, however, of the feelings of hon. members on the matter, he would confer with the Commissioners, but he could hold out no promise that the discussion would result in any better formula than that which was in the Bill.

The amendment was withdrawn.

Mr. Chorlton moved an amendment to provide that any interested undertaker, instead of only those who were under contract to the generating station in question, should be given an opportunity of making representations before any arrangement was entered into by the Board. Sir Philip Dawson suggested that there might be inserted the words "all those whom the Commissioners consider may be interested."

The Attorney-General (Sir T. Inskip) said that he could not see any great objection to saying that the Commissioners might or should notify anybody whom they regarded as interested parties. If the hon. member would allow the matter to be considered he would call the Minister's attention to the suggestion.

The amendment was withdrawn.

Mr. R. K. Law moved an amendment to give to the Electricity Commissioners the same power to review contracts made in the past as they had to review future contracts made under the provisions of the clause. Mr. Hore-Belisha said that the Board took the view that it had nothing to conceal, and it was willing to lay the agreements open to review. He was prepared to accept the amendment, although he did not like it, as a gesture of good will.

The amendment was carried by 274 votes to 42.

On Clause 2, Mr. Hore-Belisha undertook to consider whether it was possible to accept the intention of another amendment, moved by Mr. Law, to provide that any agreements which had already been entered into by the Board should be terminated unless the Electricity Commissioners were satisfied that such agreements would not result in financial loss to the Board.

The rest of the Committee stage will be taken on Thursday, December 13th.

London Electricity Charges

On December 5th Mr. West asked the Minister of Transport how many undertakings in the London and Home Counties Electricity District had a standard charge for lighting under 4d. per kWh, and how many of them were municipal undertakings?

Mr. Hore-Belisha said that of the eighty-three undertakings in the area mentioned ten had a separate standard or flat-rate charge for lighting and did not offer the alternative of a two-part tariff under which the unit charge was not determined by the purpose for which electricity is consumed. Of those ten undertakings four municipal authorities and one company made a charge of 4d. per kWh or under for lighting purposes. Of the undertakings which combined the offer of an all-in tariff with an alternative flat-rate charge for lighting the flat-rate charge for lighting was 4d. or under in the case of twenty-eight undertakings, of which twenty-two were municipal and the remaining six company undertakings.

The Price of Electricity

On December 10th Mr. H. Williams asked the Minister of Transport if he could state for the latest year available the average price charged per kWh of electricity sold, excluding intersales, by public authorities and companies, respectively.

Capt. Hudson said that the average price obtained by authorised undertakers in 1933 per kWh of electricity sold for all purposes, including power supplies, traction, street lighting and domestic supplies, but excluding intersales, was in the case of public authorities 1.29d., and in the case of companies 1.27d.

Mr. West asked what was the average price of electricity sold to the consumers in this country; and what would be the national annual saving if the average price were 1d. per kWh.

Captain Hudson replied that the average price obtained by authorised undertakers in the calendar year 1933 for electricity sold to consumers in Great Britain was 1.295d. per kWh. If the sales of electricity in that year had been at an average price of 1d. per kWh, the revenue received from consumers would have been reduced by about £13,490,000.

Comparative Electrical Outputs

On December 10th Mr. West asked what was the electrical output per head of population in Canada, Norway, and Great Britain.

Captain Hudson said that published statistics indicated that the electrical output (excluding the output of private plant) per head of population, in 1932-1933 was approximately 1,460,940 and 300 kWh in Canada, Norway and Great Britain respectively.

The Consumption of Coal

On December 7th Sir Robert Gower asked the Secretary for Mines if he could state the percentage of the total Home consumption of coal used in generating electricity, in the production of gas, and in the iron and steel industry in 1913, 1925, 1929, and 1933; and whether less coal per unit of electricity, gas, and iron and steel products was used during those years.

Mr. E. Brown said that the following information was available:—

Year.	Percentage of the total home consumption of coal in Great Britain used		
	In generating electricity.*	In the production of coal gas.	By the iron and steel industry.
1913	2.7	9.1	17.0
1925	4.8	9.7	12.5
1929	5.7	9.7	13.5
1933	7.0	10.9	8.8

* At works belonging to authorised undertakings and to railway and tramway authorities.

There had been a progressive reduction in the quantity of coal used per unit of production in these industries during this period.

In the Courts

IN the Chancery Division on December 7th Mr. Justice Bennett had before him an action brought by Sir H. Peat and Mr. Lewis Civvall, the joint liquidators of Electric Lamp Factors, Ltd., (in voluntary liquidation), against Messrs. Duncan Watson (Engineers), Ltd., to recover damages for the alleged breach of contract by the defendants to purchase the plaintiffs' Preston, Warrington, and Accrington branches and to make an offer for their London branch. Defendants denied that there was any concluded agreement.

Mr. A. Grant, K.C., for the plaintiffs said that his clients were wholesale dealers in all kinds of electrical appliances with branches all over the country. There was a ring of manufacturers known as the E.L.M.A. which controlled and kept up the price of goods and which assumed the right of imposing fines upon dealers who broke their agreements with the Association and to refuse further supplies. In 1933 the plaintiff company incurred the wrath of the Association, which imposed a fine of £1,500 and laid a ban on them, thus preventing their getting goods. This led to the precipitous collapse of the plaintiff company, which went into voluntary liquidation on September 27th, 1933. Sir Harry Peat and Mr. Lewis Civvall, chartered accountants, were appointed joint liquidators. The contract relied upon by the plaintiffs was contained in letters between Sir Duncan Watson and the liquidators of the plaintiff company in November, 1933, whereby the former agreed to purchase the branches mentioned and to make an offer for the London branch.

Sir Herbert Cunliffe, K.C., for the defendants, in reply to his Lordship, said he agreed that if there was the contract as alleged and there had been a breach of it there must be an inquiry as to damages. But his case was that there was no concluded contract.

Mr. Grant, continuing, said that owing to the repudiation of their agreement the liquidators had to get rid of the stock at the various branches at break-up prices and to let the premises as best they could.

At the conclusion of the arguments of Counsel for the plaintiffs and without calling upon Counsel for the defendants, his Lordship dismissed the action with costs. In giving judgment he said the plaintiffs' case had as many holes in it as a colander. He found that the letter relied on by the plaintiffs merely contained an agreement to make an agreement and that there was no concluded contract.

Capital Reduction

In the Chancery Division on Monday Mr. Justice Eve had before him a petition by the Premier Electric Welding Co. (Mersey), Ltd., for the confirmation of a reduction of its capital from £60,000 to £45,460.

Counsel in support of the petition stated that the nominal capital was £60,000, but only 43,620 £1 shares had been issued. It was proposed to return to the shareholders 6s. 8d. on their shares, being surplus assets.

His Lordship sanctioned the reduction.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Our December 28th Issue

Our Advertisement Department asks us to remind advertisers that copy and blocks for advertisements to appear in our issue of December 28th should reach us by Monday next, December 17th.

A New Sadia Factory

A new factory has recently been opened by Aidas Electric, Ltd., at Park Avenue, off the North Circular Road. The company states that during the last twelve months sales of its water heaters have increased so rapidly that it has been found almost impossible to cope with them, and plans were prepared for a modern factory having double the output with provision for further extensions when necessary. The layout has been planned to avoid unnecessary handling and to give a maximum output from the floor space available. The raw-material stores are in the centre and the heaters work their way round the sides of the building, each process being next to the previous one and with convenient access to the stores in the centre. The completed heaters finally finish up in the stock racks, from which they are taken as required to the packing department. The registered office is now at Sadia Works, to which all correspondence should be addressed.

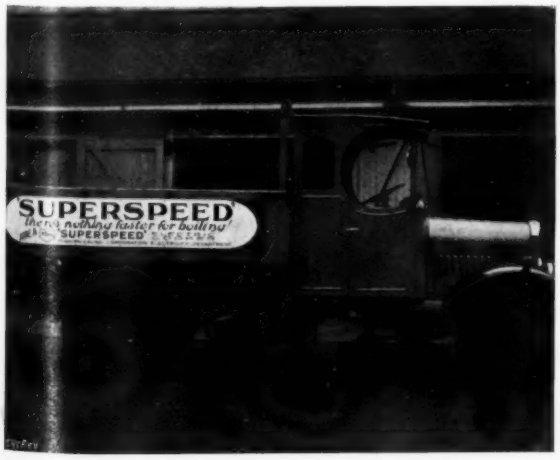
The new factory of Aidas Electric, Ltd.

The Engineers' Club, Manchester

With the object of extending the sphere of utility of the Engineers' Club, Manchester, and thereby increasing the membership, the committee is giving consideration to the enrolment of a new class of members to be called "evening" members. This class is intended to embrace members of the engineering and kindred societies whose duties or places of business preclude their making use of the club premises during the day-time. It is proposed that the annual subscription for this class of member shall be two guineas, as against eight guineas for full members. "Evening" members will have all the privileges of the club from 4 p.m. each day and from noon on Saturdays. They will be entitled to introduce friends and ladies to the club for meals after 4 p.m. Full particulars can be obtained from the hon. secretary, the Engineers' Club, Manchester.

Electrical Publicity at Ealing

The accompanying illustration shows one of the service vehicles of Ealing Corporation Electricity Department which have now been fitted with bold vitreous-enamelled advertisement plates drawing attention to Revo "Superspeed" electric cookers which the Department is hiring out on attractive terms.



A service vehicle of Ealing Electricity Department showing the plate advertising "Superspeed" cookers

The E.D.A. Films

Sir Percival Bower, president of the British Electrical Development Association, presided at a luncheon on Wednesday last week at Birmingham at which many members of the Association in the Central England Area and others engaged in the electrical industry were present. Prior to this function the three E.D.A. films were shown at the Gaumont Theatre, where Capt. J. C. Chaytor (area chairman) welcomed the visitors. He pointed out that the Association realised that only by making the fullest use of all forms of publicity could the industry hope to reap its adequate reward. Speaking at the luncheon which was attended by the Lord Mayor of Birmingham (Ald. Grey), Sir Percival Bower said that there was an amazing amount of ignorance as to the origin and development of electricity, and of the numerous uses to which it could be applied. The object of this cinema display in the towns and villages of the country was to cultivate in the public an "electrical mind," and he recommended representatives of electricity undertakings to follow the lead given by E.D.A. The films were of definite educational value, and their propaganda importance could not be exaggerated. He believed the Association had opened up a new field which afforded many opportunities of exploitation.

In addition to London and Birmingham, pre-views of the films have now taken place at Glasgow, Edinburgh, Newcastle, Leeds, Sheffield, Hull, Lincoln, Chester, Preston, Bath, Cardiff, Birmingham, Liverpool and Manchester. Thirty undertakings in all parts of the country have entered into contracts with the Association, representing some 3,000 performances, which are being arranged without delay. Supply undertakings should arrange contracts as quickly as possible and so assist E.D.A. in securing a maximum number of large-audience winter-evening performances.

The British Electrical Development Association informs us that it will lend the band parts of the film theme song, "Plenty of Time for Play," for any electrical or other dance. The music was used with good effect at the recent E.I.B.A. Ball.

Newcastle Contractors' Dinner

At the recent annual dinner of the Newcastle branch of the Electrical Contractors' Association, the Deputy Lord Mayor (Councillor W. R. Wallace), referring to contracts, said he was sorry to say that the Newcastle Corporation was sometimes the biggest offender in placing contracts outside the North-East Coast; recently five contracts were sent to the South of England. Mr. R. P. Sloan, managing director of the North-Eastern Electric Supply Co., proposed the toast of the Association, and said that he thought that within six or twelve months there would be some practical results from the setting up of the North-Eastern Development Board. He referred to his impending retirement as managing director of his company, but said he would still retain the position of chairman.

Electrical Wiring in Birkenhead

The Birkenhead Town Council has waived all resolutions prohibiting the electrical engineer from carrying out work on public buildings and Corporation property. He may also tender for assisted wiring installations. In a recent discussion, Mr. Prentice asked if it was in the interests of ratepayers for the work to be given to the Electricity Department when it charged more than private contractors. If they were going to set up a new department they would have to obtain men to do the work, and they did not even know that they would get the jobs in competition with private contractors. That would practically mean the Corporation being forced to give the work to the Department, irrespective of the cost.

Tenders for an Australian Power House

Tenders for the extension of the East Perth power house have been considered by the Western Australian Government, but no decision has yet been made. Mr. W. H. Taylor, general manager of the tramways and electricity supply, who was in London during the summer to supervise the calling of tenders,

recommended acceptance of the second lowest tender. The Government then consulted a British firm of consulting engineers, who recommended the lowest tender. Mr. Taylor, however, adhered to his decision, and the Cabinet has now submitted certain aspects of the proposals for further advice, which have arrived by mail. Altogether the extensions are expected to cost about £500,000, and the difference between the two tenders is about £20,000. The work will not be covered by one contract, but embraces several sets of tenders, and some of the work will be given to local concerns. The bulk of the work, however, must by its nature be undertaken by British interests, and it is in respect of this part of the work that opinions as to the tenders are at variance.

French Duty on Electrical Apparatus

The French *Journal Officiel* of November 24th contains a decree dated November 15th, which raises a new sub-heading to Tariff No. 524 *bis* B to cover non-automatic apparatus worked solely by hand for cutting off, regulating, protecting and distributing electric current, including electric switchboards, mounted or not, made of moulded materials or in which at least 10 per cent. of the total weight is represented by parts made of moulded materials, with or without parts of pottery, weighing less than 5 kg. each. According to the *Board of Trade Journal* the duty on goods falling under this sub-heading is fixed at 18 fr. per kg. (under the "Minimum" tariff), instead of 4.75 or 7 fr. per kg., as hitherto.

The Marking of Goods Imported into Finland

A Decree dated November 16th relating to the compulsory marking of the origin of certain goods imported into Finland provides for the marking with the country of origin of electric light bulbs, except those for pocket torches. The mark must be etched on the glass bulb in letters at least 3 mm. high, and in addition printed or stamped on the commercial packing in letters at least 5 mm. high. The mark must be in Finnish or Swedish, or any foreign language commonly used in international trade.

The Lighting Service Bureau

A temporary lecture-demonstration room capable of accommodating 200 people was opened in the neighbouring Brettenham House on Monday for use by the E.L.M.A. Lighting Service Bureau during the reconstruction necessitated by the recent fire. The main entrance to Brettenham House is in Lancaster Place, leading to Waterloo Bridge. The offices and principal demonstration room of the Bureau are still intact, and inquiries and visits should still be made to 2, Savoy Hill, W.C.2.

Fire Losses

According to *The Times*, the cost of the principal fires in Great Britain and Ireland during November is estimated at £718,000, which is a larger monthly total than usual. A list is given of the principal fires which occurred during the month, including the following items:—"Electric lamp showrooms, Savoy Street, London," £20,000; and "electrical works, Manchester," £10,000.

New Electricity Showrooms

In our last issue we briefly recorded the opening of the new electricity showrooms of the North-Eastern Electric Supply Co., Ltd., at East Boldon, Co. Durham. We now reproduce exterior and interior views of these showrooms, which were designed by Messrs. L. J. Couves & Partners, of Newcastle-upon-Tyne. They comprise a general showroom for the display of fittings and apparatus, a model kitchen and the cashier's department on the ground floor, with a large workshop, meter and other stores, and a garage at the rear of the showrooms. On the first floor are the administration offices of the Lighting and Heating Department and the Operation Department. The premises were formally inaugurated by Councillor J. C. Edington, chairman of the East Boldon Parish Council, on November 25th, and Mr. W. F .T. Pinkney, engineer of the Lighting and Heating Department, acted as host on behalf of the company.

In our issue of November 30th we reported the opening of the new Acocks Green showrooms of the Birmingham Corporation Electric Supply Department, and we now reproduce a photograph of the general showroom which conveys an impression of the attractive layout of these new premises.

The Acocks Green showrooms of the Birmingham Electric Supply Department

The new electricity showrooms of the Gellygaer Urban District Council were formally inaugurated on December 6th by Ald. W. Hammond, chairman of the Council, and Councillor W. A. Hancock, chairman of the Electricity Committee.

The Electricity Committee of Bury (Lancs.) Corporation has approved a scheme for the conversion of part of the Town Hall into electricity offices and showrooms at an approximate cost of £9,500.

Holidays

The offices of the Jackson Electric Stove Co., Ltd., will be closed from midday on December 22nd until Thursday morning, December 27th.

The works of Messrs. Bruce, Peebles & Co., Ltd., will close on Friday evening, December 28th, and reopen on Monday morning, January 7th. The head office in Edinburgh will be closed on Christmas Day.

Recent Contracts

International Combustion, Ltd., has recently supplied two "L" stokers for H.M. Dockyard, Chatham (through Yarrow & Co.), three twin stokers for the Blackburn Meadows power station (Sheffield Corporation), two "L" stokers for the East power station, Newport, and one "L" stoker for Ryde pumping station, Australia.

Messrs. Hick, Hargreaves & Co., Ltd., have recently secured contracts for a 50,000-kW surface condensing plant with auxiliaries and closed feed system for the Ironbridge generating station of the West Midlands Joint Electricity Authority, a 30,000-kW surface condensing plant for the Northampton Electric Light & Power Co., Ltd., and a large central evaporating plant for the Klip power station of the Victoria Falls and Transvaal Power Co. Other orders received include a 1,000-kW pass-out turbine for the East Lancashire Paper Mill Co., Ltd., a 1,500-kW turbo-alternator for the English Sewing Cotton

The new premises at East Boldon of the North-Eastern Electric Supply Co., Ltd., showing the exterior and the general fittings and apparatus showroom

Co., Ltd., Belper branch, which is the fourth machine to be supplied to this company, a 10,000 cu. ft. per minute turbo-compressor for Messrs. J. & J. Charlesworth, Ltd., Wakefield, and a number of rotary air compressors of the Hick-Wittig type for various industries.

1834-1934

The extensive organisation of Pinchin, Johnson & Co., Ltd., is celebrating its centenary, and to mark the occasion a handsome brochure "Through Four Reigns" has been produced. In this volume an interesting story is unfolded of progress in the manufacture of decorative and protective finishes. Changing conditions have brought new problems, but such has been the effectiveness of research work carried out by the company's staff that in many cases materials have been marketed in advance of contemporary production. An instance of this kind is the insulating compound introduced in the early days of industrial electricity; to-day this compound is widely used and highly valued by electrical engineering firms. Not to keep abreast of the times but ahead of them has consistently been the company's policy, and Mr. R. Paltridge, the managing director, in this way expresses its aspirations for the future. Justification for the claim to being the widest paint service in the world is found in a pictorial analysis of overseas activities towards the end of the centenary book. A map indicates that factories, offices, agents and connections have been established in hundreds of towns from Stockholm to Wellington and from Tokyo to Buenos Aires. These activities in remote parts have as their focal point the company's impressive new headquarters at 4, Carlton Gardens, London, S.W.1.

A London J.E.A. Booklet

The London & Home Counties Joint Electricity Authority has issued to consumers in its area an attractive booklet setting forth its hire charges for electric cookers, water heaters, and other domestic appliances. The publication, which is profusely illustrated, also gives particulars of the Authority's assisted wiring scheme and its rates and tariffs in the various districts. A map is included showing the distribution areas covered by the Authority.

Social Events

The annual dinner of the Cardiff Corporation Electricity Department was held recently and was attended by over 100 employés of the undertaking. Supporting the chairman (Mr. O. S. Hosgood) were Ald. A. E. Gough, J.P. (chairman of the Corporation Electricity Committee) and Mr. C. G. Morley New (city electrical engineer).

At the annual dinner and dance of the Cardiff branch of the Electrical Contractors' Association held at Cardiff on Thursday last week, Mr. W. J. Creemer presided. "The Electrical Contractors' and Allied Associations" was proposed by the Deputy-Lord Mayor of Cardiff (Councillor James Griffiths, J.P.) and responded to by Mr. T. E. Alger (past president). Mr. R. L. Booth proposed "Other Sections of the Industry," Messrs. C. G. Morley New and W. J. Terry responding.

The B.I. Players (British Insulated Cables, Ltd.) presented "Hay Fever" by Noel Coward at the B.I. works canteen on Thursday and Friday last week. A strong cast gave excellent performances which were well received by large audiences. The music was provided by the works band, under Mr. W. Boots.

The annual staff dinner and dance of the Enfield Cable Works, Ltd., will be held on January 12th at the Midland Grand Hotel, St. Pancras Station, N.W.

An Electrical Exhibition at Paisley

An electrical exhibition, organised by the Paisley Corporation Electricity Department, was held recently at the Town Hall, Paisley. In addition to a comprehensive display of domestic electrical appliances by the leading manufacturers, special demonstrations were given of electric cooking. The Electricity Department had an inquiry bureau, while local electrical contractors were in attendance to give advice relating to hired appliances and installations. The attendance during the week's run of the exhibition was about 15,000, and good business was done by the Electricity Department in connection with the installation of electric cookers and water heating apparatus.

Railway Point-operating Machines

The series of B.S. Specifications for railway signalling apparatus has been steadily growing during the past two years, and the latest addition to the series deals with the performance tests for electrically driven point-operating machines, in addition to the general features of construction, with a view to securing a standard range of machines which will be satisfactory for all normal service requirement or British and overseas railways.

Copies of this Specification (No. 581-1934) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

A Ferranti Poster Stamp

The accompanying illustration shows a new poster stamp which has just been produced by Messrs. Ferranti, Ltd., and is being sent out with all the company's mail, as an effective reminder regarding electric clocks.

The new Ferranti poster stamp

Italian Radio Imports and Exports

The latest official returns show that the imports of wireless receiving sets and apparatus into Italy during the eight months ending with August last attained a value, at 58¼ lire to the £, of £97,815, as compared with £195,215 in the corresponding eight months a year ago. There was a slight increase during the same eriod in the exports of radio material from Italy, from £26,955 to £31,880.

Trade Announcements

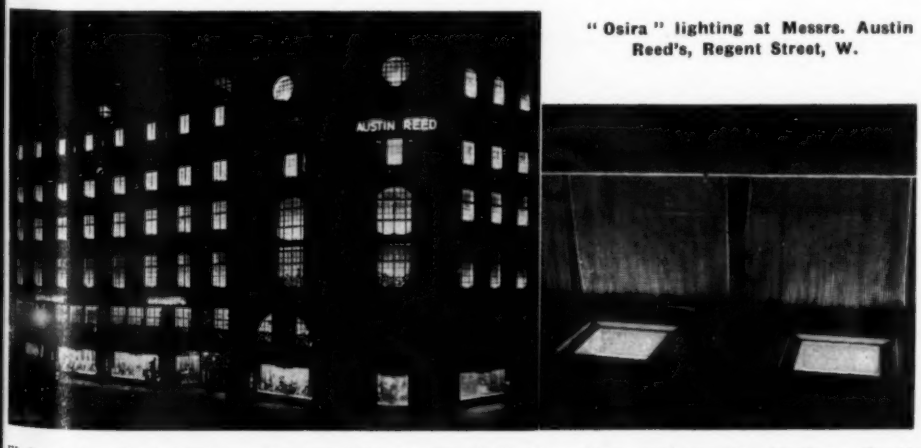
The United Electrical Co. (Coolex), Ltd., has removed to larger premises at Coolex Works, Chester Street, Birmingham, 6 (telephone: Aston Cross 2862-3).

We are informed that Messrs. Greenwood & Batley, Ltd., have appointed Messrs. Biram & Co., Ltd., as their representatives for the Eastern Counties with offices at Felixstowe and Norwich.

The Hartford Electric Co. has opened premises at 19, Gabriel's Hill, Maidstone, with electrical appliances and radio goods. The proprietor is Mr. F. J. Ford, and the manager is Mr. P. J. Dray, both of whom have been with the local firm of Drake & Fletcher.

"Osira" Store Floodlighting

Fifty-six floodlights to give golden lighting have been installed by Messrs. Austin Reed, of Regent Street, W., to attract shoppers this Christmas. The floodlights, which were switched on on December 10th, are the most recent development of the "Osira" electric discharge system of lighting introduced a short time ago by the General Electric Co., Ltd. They are used for bathing the window blinds in a golden light. The lamps used are 100-W "Osira" sodium lamps, and the company claims that they provide increased light at half the previous cost. It is the first time this system of floodlighting has been used for illuminating a London shop, and its warmth and brilliancy introduces a novel feature to London "shopland."



"Osira" lighting at Messrs. Austin Reed's, Regent Street, W.

Calendars and Diaries

An aerial view of the company's works heads the calendar of the Enfield Cable Works, Ltd., which has monthly slips showing the preceding and following months.

The calendar received from Messrs. Greenwood & Batley, Ltd., has large monthly sheets illustrating some of the company's products. Each sheet shows the preceding and following months.

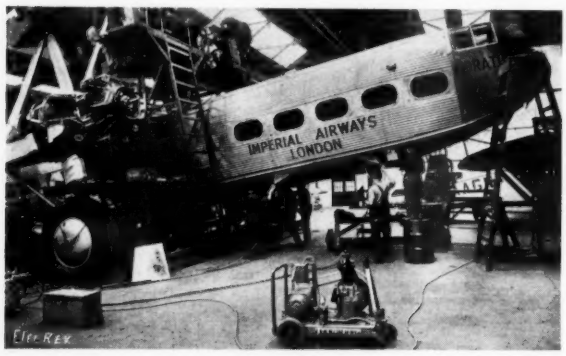
We have again received the diary of the Association of

Engineering and Shipbuilding Draughtsmen. This year it is in a neat, dark green leather binding, and as in previous years contains many pages of technical data invaluable to engineers generally.

The neat wall calendar received from Messrs. Evershed & Vignoles, Ltd., is of particular interest as each monthly sheet bears an excellent view of various watering places reproduced from photographs taken by either Mr. W. A. Vignoles or his personal friends.

Overhauling an Air Liner

The accompanying illustration shows an interesting view of an Imperial Airways liner undergoing its periodical overhaul. The machine illustrated is the *Horatius*, which recently carried



B.E.N. spraying equipment being used during the overhaul of an air liner

the first Empire air mail under the new flat rate scheme. One of the operations depicted is the spraying of the under-carriage, which is being done with the aid of B.E.N. electric spraying equipment.

The Smithfield Show

Refrigerators are the most prominent electrical features at the Smithfield Club Cattle Show, which opened last Monday at the Royal Agricultural Hall, Islington, and closes to-day (Friday). Exhibitors in this line are Aveling-Barford, Ltd., Frigidaire, Ltd., and the Lightfoot Refrigeration Co., Ltd. Petrol and heavy-oil engines for driving electric lighting sets are displayed by Blackstone & Co., Ltd., and Petters, Ltd., and Messrs. R. A. Lister & Co., Ltd., are showing a tractor plough, engines, cream separators, refrigerators, and dairy appliances. An electric motor churn and speed reducer is displayed on the stand of the Melotte Separator Sales Co. (1931), Ltd. The comprehensive display of the Wolseley Sheep Shearing Machine Co., Ltd., includes cream separators and shearing and horse-clipping machines. Other exhibitors include British Automatic Refrigerators, Ltd.; J. & E. Hall, Ltd.; Herbert & Sons, Ltd.; Hobart Manufacturing Co., Ltd.; and the Peerless Electrical Manufacturing Co., Ltd.

A 25-ton Electric Factory Truck

What is claimed to be the largest electric elevating factory truck in the world is being acquired for service in the works of Briggs Bodies, Ltd., at Dagenham, Essex, where the bodies of Ford vehicles are made. It is an Elwell-Parker machine, the sole licensees for which in this country are Gillespie Partners, Ltd., who have now arranged for the construction of 2- and 3-ton trucks in Great Britain. The machine for the Briggs works is of the elevating type and has been designed to transport and lift loads up to 25 tons at a time, the work involving the removal of heavy dies from racks or other storage space and their transport to large presses used for the manufacture of car bodies. The truck runs on six wheels, two at the front being fitted with 22 by 8-in. solid rubber tyres and four trailing wheels with 18 by 12-in. tyres mounted on tandem axles in order to distribute the load over a large area.

Compensation Claim Awards

There was a settlement to a claim at Southwark County Court on Thursday last week, before Judge Bensley Wells, made by Charles Baker, of Westcliffe ,an employé of the Bermondsey Borough Council. It was stated that in July, 1931, he was working as an electrician and was earning at that time £5 7s. 6d. a week. He touched a live wire, there was a flash and an explosion, and the result was that his eyelashes and face were burned, and he suffered very seriously from shock.

Mr. Duckworth, who appeared on behalf of Baker, said that his client was now quite unable to do anything in the way of electrical work, except that he could work with dead wires, and that was no use, as the employers wanted a man who could deal with live wires. The parties had come to a settlement for £450.

Judge BensleyWells agreed to the settlement.

On Friday last at the Stafford County Court, Judge Ruegg gave his reserved judgment with regard to the claim for compensation made by Florence May Keeling, of Friar Street, Stafford, against the English Electric Co., Ltd., in respect of the death of her husband, William Thomas Keeley, an employé of the company, who died following an electric shock received while working on a switch at the Central Electricity Board's New Mills sub-station, Derbyshire.

Announcing his decision, the Judge said there was no doubt in his mind that the deceased had mistaken the switches and mounted No. 3 instead of No. 4, and he awarded the plaintiff £300 with costs. He added that the respondents could pay the money into court to act as a stay of execution if they wished to appeal.

Prices of Materials

Messrs. F. Smith & Co. report, December 12th: Electrolytic copper bars, £31 10s., £1 inc. Ditto, ditto, wire rods, £36 10s., £1 inc. Ditto, ditto, h.c. wire, 6$\frac{1}{16}$d., $\frac{1}{16}$d. inc. Silicium bronze wire, 7$\frac{7}{16}$d., $\frac{1}{2}$d. inc.

Messrs. James & Shakespeare report, December 12th: No change in the price of copper bars (best selected), sheet and rod and English pig lead. Electrolytic copper sheets, £31 to £31 10s., £1 inc.

Messrs. Edward Till & Co. report, December 12th: India-rubber, Para fine, 5d., $\frac{1}{2}$d. dec.

Engineering Wage Conference

A conference between the Engineering and Allied Employers' Federation and representatives of thirty-one trade unions will be held in London on Wednesday next to consider the claim of the unions for an advance of 2d. an hour in wages, an equivalent increase in piece-rates, and the revision of the 1931 agreement as to overtime and nightshift rates.

New Catalogues and Lists

Belling & Lee, Ltd., Cambridge Arterial Road, Enfield.—A non-technical booklet on the suppression of radio interference.

C. E. Needham & Bro., Ltd., Change Alley, Sheffield, 1.—A 160-page electrical catalogue for 1935.

Britannia Manufacturing Co., Ltd., 22, Britannia Street, City Road, N.1.—A leaflet on electric power equipment.

J. H. Dallmeyer, Ltd., 31, Mortimer Street, Oxford Street, W.1.—Particulars of the "Paroux" photo-electric illumination meter.

Cressall Manufacturing Co., 31, Tower Street, Birmingham, 19.—Leaflets on asbestos woven resistance nets, a steel jacketed unit heater, and sliding resistances.

A. G. Hackney & Co., Hanley, Stoke-on-Trent.—A leaflet on porcelain insulators.

Cochranes (Middlesbro') Foundry, Ltd., Middlesbrough.—A stock list of cast-iron and spun-iron pipes.

Higgs Motors, Ltd., Witton, Birmingham.—A leaflet on stator and rotor units.

Ferranti, Ltd., Bush House, W.C.2.—Catalogue of synchronous electric clocks.

Switchgear & Equipment, Ltd., Banbury, Oxon.—A leaflet on pull-down fuse isolators.

T. B. Morley & Co., Ltd., Jameson Street, Hull.—Catalogues of "Morco" illuminating glassware.

The entrance hall and reception room of the new showrooms of Berry's Electric, Ltd.

Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.—A catalogue of Diesel oil engines.

Firth-Vickers Stainless Steels, Ltd., Staybrite Works, Sheffield, 9.—A catalogue (150 pages) of stainless steels specially resistant to rust, acid and high temperatures.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A catalogue of over 1,000 electric lighting accessories.

Hopkinsons, Ltd., Huddersfield.—A leaflet on a combined isolating and relief valve for l.p. vessels.

Bankruptcy Proceedings

F. Adams and **R. Barlow** (trading as Adams & Barlow), electricians, 11, Station Parade, Wanstead.—These debtors attended on December 5th at the London Bankruptcy Court for public examination upon accounts showing liabilities of £1,532 against assets of £153. The debtors stated that they began business in partnership as above in December, 1931, and were financed throughout by Adam's mother. At first they were successful, but subsequently incurred losses owing to slack summer seasons and to their contracts proving unprofitable. The failure was further caused by competition, lack of capital, and underestimating the cost of work. The examination was concluded.

T. J. Coleman, electrician, lately carrying on business at 15, Burlington Mews, and 73 and 49, Churchfield Road, Acton.—This debtor petitioned the London Bankruptcy Court on Novem-

ber 27th and was adjudged bankrupt the same day. The first meeting of creditors was held on Monday, when it transpired that the liabilities to unsecured creditors amounted to £400 and there were no free assets. The debtor states that he has traded in succession as Radio-Electra Supplies, Oak Electrical Service, and Arrow Electric Service. The present business was started in 1929 and the failure is attributed to underestimating contracts and heavy overhead charges. The Official Receiver will wind up the estate in bankruptcy.

G. Y. Entwistle, 63, Shorey Bank Yard, Darwen, electrician.—The public examination was held at Blackburn on December 5th. According to the statement of affairs returned by debtor there was a deficiency of £81. It appeared that debtor commenced business in October, 1933, without capital, obtaining stock on credit. The business consisted chiefly of wiring houses for electricity. Debtor attributed his failure to paying too much for materials and wages. The examination was closed.

W. J. Davies, radio and electrical engineer, 230, Great North Road, Woodlands, Doncaster.—Receiving order made November 29th on debtor's own petition. First meeting December 19th at the Official Receiver's offices, Figtree Lane, Sheffield. Public examination January 10th at the County Court Hall, Sheffield.

W. S. Handley and **G. Taylor** (Handley & Morgan), wireless dealers, 55, Lower Union Street, Bristol.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver, released November 30th.

W. H. J. Willcox, radio dealer, 66, Soundwell Road, Staple Hill, near Bristol.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver, released November 30th.

W. R. C. Purves and **S. Bell** (Vulcan Radio Co.), 2, Murray Road, Workington.—Trustee, Mr. T. B. Harston, 18, Bank Street, Carlisle, Official Receiver, released November 29th.

T. S. Hanson, electrical contractor, 26, Nether Hall Road, Doncaster.—First and final dividend of 2s. 1¾d. in the £, payable December 11th, at 14, Figtree Lane, Sheffield.

S. Gillitt (lately trading as G.E.T. Electrical Supplies Co.), electrical goods dealer, Lansdowne, Offerton Lane, Offerton, near Stockport.—Supplemental dividend of 2s. 7d. in the £, payable December 11th at the Official Receiver's office, Byrom Street, Manchester.

H. Mozer and **S. Mozer,** radio dealers, 111, High Street, Stoke Newington, N.—Trustee, Mr. S. W. Hood, Bankruptcy Buildings, Carey Street, W.C., released November 29th.

G. T. P. Yeoman and **L. T. H. Greig,** electrical goods agents, 4, North End Road, Golders Green, Middlesex.—Trustee, Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C., Official Receiver, released November 29th.

J. Hampson, wireless dealer, 131, Blackburn Street, Radcliffe.—Trustee, Mr. R. K. Clark, Byrom Street, Manchester, Official Receiver, released December 3rd.

T. F. Jarrett (T. F. Jarrett & Co.), electrical engineer, 53, High Street, and 14, Springcopse Road, Reigate.—Last day for receiving proofs for dividend December 24th. Trustee, Mr. H. G. Daniels, The Market Hall, Redhill, and Mr. C. G. J. Silcock, 40, High Street, Reigate.

G. F. Richards, wireless and electrical dealer, 1, Peel Street, Kidderminster.—First and final dividend of 5s. 11¾d. in the £, payable December 11th at 1, Priory Street, Dudley.

Company Liquidations

Neon Installations, Ltd., 41, Great Windmill Street, W.—The first meetings of the creditors and shareholders under the compulsory liquidation of this company were held on December 6th at Carey Street, W.C. Mr. H. P. Naunton, Assistant Official Receiver, reported that the winding-up order was made on November 5th upon the petition of creditors. The company was formed on May 5th, 1933, to carry on the business of fitters and manufacturers of neon electric lights and signs. The issued capital amounted to £3,450. The directors were A. L. Josephs and P. Needham. Josephs was appointed life director, managing director and chairman, and had drawn £843 during the company's existence, or an approximate average of £18 a week. He (Josephs) had stated that he began business under the style of "Neon Installations" in April, 1932. The accounts of his trading from April, 1932, to July, 1933, showed a turnover of £11,257 and a net profit of £1,731. The company acquired the business as from July 31st, 1933, for £1,298, the agreement further providing that Josephs should apply and pay for £998 in ordinary shares. The accounts prepared at that date disclosed liabilities of £1,924 and assets of £3,322. The company was apparently always short of capital. In April last the company took over the business of Violite for £2,250, payable as to £83 cash down and the balance by monthly instalments, only two of which, however, had been paid at the date of the winding-up order. The company executed a deed of assignment over its book debts in June and borrowed £400 on the security of a 7 per cent. debenture for that amount. Subsequently creditors attempted to levy execution, and on July 12th last Mrs. Josephs, as the debenture-holder, appointed Mr. F. H. Hart as receiver. He had carried on the business with a reduced staff in the hope of selling it as a going concern, but so far he had been unsuccessful. The trading accounts of the company from August 1st, 1933, to June 23rd, 1934, disclosed a turnover of £10,364, a gross profit of £4,371, but a net loss of £1,159. The failure was attributed to lack of capital, heavy overhead expenses and the absence of normal credit facilities. A draft statement lodged under the liquidation showed unsecured liabilities of £4,325. The Official Receiver was of opinion that the assets would not realise sufficient to discharge the debentures, there could be nothing for the unsecured creditors. The liquidation was left in the hands of the Official Receiver.

Palace Radio Co., Ltd., Paignton.—The statutory meeting of the creditors herein was held recently at the offices of Messrs. Ollett & Janes, 44, Victoria Street, Paignton. The statement of affairs showed ranking liabilities of £1,119. The total assets were £554, leaving a deficiency, so far as the creditors were concerned, of £565. Resolutions were passed confirming the voluntary liquidation of the company with Mr. F. C. Ollett as liquidator, with a committee.

Radio Exchange Service, Ltd.—Meeting January 4th at Holderness Chambers, Bowlalley Lane, Hull, to receive an account of the winding-up by the liquidator, Mr. W. Cardwell.

Electricity Supply

Lighting, Domestic, Power

Accrington.—SUPPLY EXTENSION.—The provision of a supply to the Oswaldtwistle and Gallows Hall Farm districts is under consideration.

LOAN.—The Electricity Committee is seeking sanction to a loan of £6,000 in connection with the bulk supply which, with Rawtenstall Electricity Department, it is to afford to Haslingden Corporation.

Aldershot.—SUPPLY EXTENSIONS.—The Town Council is to extend the mains to supply houses in Elston Road and Perowne Street.

Ascot.—HOSPITAL EQUIPMENT.—X-ray and other medical apparatus and an emergency lighting set are to be installed at Heatherwood Hospital.

Ashby Woulds.—UNDERGROUND MAINS.—The Urban District Council has consented to the application of the Leicestershire & Warwickshire Electric Power Co. to lay underground mains in the Daybell district of Moira.

Barnoldswick.—UNDERTAKING TO BE RETAINED.—The Council has decided not to sell its undertaking to the Electrical Distribution of Yorkshire, Ltd.

Barrow-in-Furness.—A £12,000 SCHEME.—The Electricity Committee recommends the provision of a supply to Hawkhead and the connecting up of the e.h.v. system with the Coniston

Street lighting at Littlehampton by 250-W Siemens "Sieray" electric-discharge lamps

supply at a total estimated cost of £12,167, the work to be undertaken early next year.

ELECTRICAL APPARATUS.—The Electricity Committee is to borrow £7,500 for consumers' electrical apparatus.

CHANGE-OVER.—The supply to the Ilkley Park Estate houses is to be changed-over to a.c.

Bath.—REVISED CHARGES.—The Town Council has adopted a new domestic rate for private residences and flats, with a standing charge according to the rateable value, and a "unit" charge of ½d. (¾d. if an electric cooker or thermostatically controlled water heater is used). Other charges have been revised, with reductions from 25 to 11 per cent., and the minimum charge has been abolished.

Batley.—BULK SUPPLY.—Alderman J. W. Schofield informed the Town Council that the Electricity Committee had made an arrangement with the Yorkshire Electric Power Co. under which the Batley station will cease to generate electricity as from March 31st, 1936, when a complete bulk supply will be taken indirectly from the Central Electricity Board. He said that cheaper electricity was not to be expected under the grid system, adding that if the Corporation had been allowed to lay down plant sufficient to meet its own requirements it would have produced energy at a cheaper price.

CHANGE-OVER.—The Upper Batley supply is shortly to be changed over from d.c. to a.c.

Bellshill.—SCHOOL LIGHTING.—At a meeting of the Lanarkshire School Management Committee for Bellshill and district the clerk stated that an experiment had been made in the lighting of Bothwell Park School with superheated gas burners, but this was not a success. The committee unanimously agreed to recommend the County Council to install electric lighting.

Birkenhead.—DOMESTIC PROGRESS.—The number of appliances issued by the Electricity Department during 1933-1934 was 5,373, which is sixty-three fewer than 1932-33, although the capacity increased from 8,212 to 9,331 kW and the amount of electricity sold for domestic purposes rose from 21,128,630 kWh to 23,480,909 kWh. An analysis shows that irons accounted for the drop in the number of appliances issued, as they decreased from 2,857 to 1,971. The biggest increases were in fires, 968 (555 in 1933), water heaters, 294 (169); kettles, 675 (590); and vacuum cleaners, 567 (469). The demand for smaller cookers is reflected by the fact that while the number

installed rose from 672 to 685 the capacity decreased from 4,076 kW to 3,917.

NEW SWITCHGEAR.—Application is being made by the Electricity Committee for sanction to borrow £840 for five new switch panels to furnish supplies to a new consumer; also £846 for the provision of transformer and switchgear at Nelson Street sub-station.

MAINS AND SERVICES.—The Committee recommends application for sanction to the borrowing of £25,000 for mains and services in the Wirral area, and has obtained sites at Eastham and in Gautry Road for the erection of sub-stations.

Birmingham.—SUB-STATION.—A sub-station is to be erected at Highters Heath Lane, Mill Pool Hill Estate.

Blackpool.—SUB-STATIONS.—The Electricity Committee is to erect sub-stations at Whiteholm, Carleton, and Luton Road, Anchorsholme.

Bridlington.—REDUCED CHARGES.—The Town Council has adopted, as from February 1st next, charges of 5d. to 4½d. per kWh for lighting (according to demand) and 3d. to 1d. for power.

Brighton.—SCHOOL HEATING.—The General Purposes Committee has asked the Education Committee to heat a new infants' school at Whitehawk by electricity instead of the usual solid-fuel equipment.

INCREASED DEMAND.—The engineer reports that the growth of load on the undertaking has proceeded at a rate which necessitates increasing the h.v. system pressure from 8 kV to 11 kV before the winter of 1935 instead of 1936 as originally intended. The cost will be £10,400. Expansion of demand is also reflected in a decision to erect sub-stations at Southwick (£3,787), Manor Farm Estate (£6,000), Nicholson's Wharf (£1,027), Dyke Hotel (£135), Fulking and Newtimber (£250). In most cases 250-kVA transformers will be fitted. Mains are to be extended at a cost of £2,361.

Bristol.—ELECTRICAL MACHINERY PREFERRED.—The Docks Committee recommends a scheme for the replacement of the steam-driven hydraulic pumping machinery and plant at the Avonmouth dock and the dry-dock pumping and impounding machinery at the Royal Edward dock by electrical machinery. The total estimated cost is approximately £42,000.

FRINGE ORDER.—The Electricity Committee recommends that application be made to the Electricity Commissioners for a Fringe Order to enable the Committee to provide a supply to Bishopsworth.

Caernarvon.—REDUCTION OF CHARGES.—Electricity charges are to be reduced as follows: Lighting flat rate, from 5½d. to 5d. per kWh; and the "unit" charge of "all-in" rate from 1d. to ¾d. The reductions are operative as from October 1st last and represent a saving of £1,659 per annum to consumers.

WATERLOO PORT.—The electrical engineer has been instructed to proceed with the work of supplying electricity to houses at Waterloo Port.

Canada.—TORONTO.—The Hydro-Electric Power Commission of Ontario has announced its intention of studying methods of using hydro-electric energy for the manufacture of cheap oxygen and hydrogen and low-cost gas. It is hoped by developing these methods to attract a number of industries to Ontario, and thus to create an outlet for the Commission's surplus energy. The process by which the gas would be produced could, it is pointed out, yield carbon dioxide as a by-product, and this might be solidified for use as "dry ice," a refrigerant.

Carlisle.—EXTENSIONS.—The Electricity Committee has approved plans for the extension of mains in the city at £677 and at £1,818 in the rural area. It is also proposed to spend £7,895 on extending mains from Dalston to Burgh, to How, How Mill and Fenton (£727), and to Newtown, Irthlington (£328). Mr. C. W. Salt is the city electrical engineer.

Chesterton.—OVERHEAD LINES.—The Beds, Cambs & Hunts Electric Supply Co. proposes to erect overhead lines to provide a supply to Milton.

Chichester.—SUPPLY EXTENSION.—The Rural District Council has decided to offer no objection to the use of overhead lines by Portsmouth Corporation for supplying electricity to Chidham.

Clitheroe.—DOWNHAM SCHEME COMPLETED.—With an extention to Downham the Electricity Department has now completed a scheme of rural electrification costing £25,000. An 11,000-V section connects Worston and Downham sub-stations.

Cloughton (Yorks).—SUPPLY INAUGURATED.—A supply of electricity was made available on December 5th. Already over half the houses in the village are wired, and several more will be connected before Christmas. The supply is received from Lancaster.

Colchester.—LOANS.—The Electricity Committee is to borrow £2,360 for mains, £510 for plant, £5,000 for wiring installations, and £20,000 for apparatus.

SUPPLY TO NEW HOUSES.—The Electricity Committee is to provide a supply to houses in course of erection near Old Heath Road.

LOAN.—Sanction has been obtained to a loan of £38,000 for mains and services.

Coningsby.—SUPPLY ARRANGEMENTS.—A supply of electricity is expected to be available by Christmas.

Darlington.—REDUCED CHARGES.—A special discount of 20 per cent. on all charges for electricity consumed during the quarter ending in December has been fixed by the Electricity Committee.

Dartford.—OVERHEAD LINES.—The Rural District Council has consented to the use of overhead lines by the West Kent Electric Co. at Hartley and Fawkham, but has asked the company to lay underground cables wherever possible.

Dover.—SWITCHGEAR.—Extensions and alterations to switchgear are to be made at a cost of £3,115.

East Ham.—MENTAL HOSPITAL SCHEME.—The Electricity Committee is to borrow £22,639 for electrical plant, wiring, &c., in connection with the erection of the East Ham and Southend-on-Sea Joint Mental Hospital at Runwell.

Elham.—RURAL SUPPLIES.—The Folkestone Electricity Supply Co., Ltd., has informed the Rural District Council that no time is being lost in extending the supply of electricity to Ottinge and Elham, and that arrangements for supplying Lympne depend upon the Air Ministry. At Hawkinge the amount of support promised did not at the present time justify the expenditure involved.

Forehoe.—ELECTRICITY FOR BAWBURGH.—Norwich Electricity Department has informed the Rural District Council that an effort will be made to give a supply of electricity to Bawburgh early in January.

Gloucester.—ADDITIONAL POWERS SOUGHT.—The Corporation is to introduce a Bill in the present session of Parliament for, *inter alia*, further powers with regard to its electricity undertaking.

Guildford.—EXTENSIONS.—The Electricity Committee is to extend mains to supply forty houses at Shalford and twenty-six at Perslake.

STREET LIGHTING.—The Electricity Committee is to consider the use of "daylight" lamps for street lighting.

Hull.—LOANS.—The Electricity Committee is to seek sanction to borrow £50,000 for mains and £50,000 for sub-stations and equipment.

India.—MOOKURUTHI HYDRO-ELECTRIC SCHEME.—Major H. G. Howard, chief engineer, Hydro-Electric Department, Madras, has, it is understood, submitted plans to the Provincial Government for developing the Mookuruthi hydro-electric scheme with the object of supplementing the Pykara scheme. The cost is estimated at about Rs.1,800,000.

Kirkcaldy.—SUPPLY AREA.—The Town Council has received a reply from Fife Electric Power Co., Ltd., to the effect that the directors of the company are unable to entertain the suggestion that its supply area shall exclude Dysart and county districts affected by the Burgh Extension Order of 1930. The Town Council has decided to insert a clause in the next Provisional Order providing for the acquisition of the rights of supply. In the meantime it is recommended that the town clerk shall write to the company asking for its terms for lighting the streets of Dysart with electricity.

Kirkside (Cumberland).—STREET LIGHTING.—The Mid-Cumberland Electricity Co., Ltd., has decided to provide electric street lighting for Kirkside.

Leyton.—REDUCED CHARGE.—The Town Council has decided to supply electricity used after 6 p.m. for Christmas decorations at the reduced charge of 2d. per kWh.

Liverpool.—CLARENCE DOCK STATION.—For the provision and installation of additional evaporating plant at the Clarence Dock power station and a steam main from the station to the premises of Messrs. J. Bibby & Sons, Ltd., Great Howart Street, Liverpool, it is recommended that sanction shall be sought to a loan of £13,000. One of the conditions of the arrangement is that the supply of steam shall continue for a period of at least ten years.

London.—HORNSEY.—The Electricity Supply Committee recommends the expenditure of £16,826 and £2,900 on an electricity sub-station at Coldfall and additional plant for the Crouch End sub-station.

Luton.—LOAN.—The Town Council has applied for a loan of £30,000 for mains and services, house services, and meters.

Maidstone.—UNIFORM POWER TARIFF.—The Town Council has fixed a new tariff for large power users as from January 1st next. There will be a uniform charge of 0.46d. per kWh. in place of the present sliding scale, varying from 0.475d. to 0.46d. per kWh.

MAINS EXTENSIONS.—The Council is to provide a loop main between East Farleigh and Keston (£4,920), and extensions to the London Road Estate, where eighty houses are to be built, Sutton Road and Boughton.

Malden (Surrey).—STREET LIGHTING IMPROVEMENTS.—A street lighting improvement scheme costing £3,900 has been approved by the Council.

Manchester.—STREET LIGHTING.—Instructions have been given by the Highways Committee for additional lighting and for alteration of lighting in several of the principal streets, including the replacement of ninety-one gas lamps by electric units.

PROPOSED EXPENDITURE.—The Electricity Committee is to borrow £13,589 for plant and building work; £50,000 for sub-station equipment, and £5,000 for public lighting fittings.

Newport (Mon).—RURAL SUPPLY.—St. Mellons Rural District Council has decided to approach the Town Council with a request that it will reconsider its decision not to extend its supply lines to Penhow and Llanmartin.

Nuneaton.—REDUCED CHARGES.—The Council has sanctioned the Electricity Committee's proposal to reduce the primary lighting rates by 1d. per kWh. This and other reductions which are to come into force on January 1st will benefit consumers by £4,180 per annum.

Oxford.—STREET LIGHTING.—The Revo Electric Co., Ltd., asks us to state with regard to the illustration in the ELECTRICAL REVIEW last week of street lighting in Carlton Road, Oxford, that this is in the area of the Oxford Electric Co., Ltd.

Penmaenmawr.—REDUCED CHARGES.—The Urban District Council is to reduce the charge for lighting by 1d. per kWh as from April 1st next, when it will abolish the minimum charges.

Pittenweem (Fife).—SUPPLY OFFERED.—The Town Council has been offered a supply by Fife Electric Power Co., providing the Council lays the pavements after the installation cables. This the Council has consented to do in cases where it has been previously decided to erect poles.

Plymouth.—NEW CABLES.—The Electricity Committee is to lay further cables at an estimated cost of £1,094, and to erect a sub-station on a site adjoining the Guildhall.

SELECTED STATION.—It is proposed that the Central Electricity Board shall take over the Plymouth generating station on January 1st.

Plympton.—RURAL SUPPLIES.—According to the *Western Morning News* an important scheme for the extension of the Plympton Rural District Council electricity undertaking from Crownhill to Roborough and Tamerton Foliot is to be started shortly. It has been decided to lay a high voltage main from Crownhill to Roborough and from Roborough to Tamerton Foliot. The intention of the Council is subsequently to have two ring mains, one from the Egg Buckland and Compton district to Plympton, and the other from Newton Ferrers and Revelstoke *via* Ermington to Ivybridge. Recently the Council carried out a large extension of the undertaking for the supply of electricity to Newton Ferrers and Revelstoke, by means of an extension *via* Staddiscombe and Wembury, negotiating the River Yealm by a submarine cable.

Pontiottyn.—NEW LIGHTING SYSTEM INAUGURATED.—On Tuesday last week a system of "anti-dazzle" electric street lighting was inaugurated by the Gellygaer Council.

Reading.—MAINS EXTENSIONS.—Mains extensions are to be carried out at a cost of £4,180 to improve the supply in the Caversham Heights area.

Reigate.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £24,050 for mains laying and for the erection of sub-station kiosks and transformers in connection with the reconstruction of the supply system.

Ripon.—CHRISTMAS SHOP LIGHTING.—The Chamber of Trade announces that concessions have been secured from the Corporation for the traders of the city with regard to lighting for the Christmas season.

Rowley (Durham).—ELECTRIC LIGHTING WANTED.—The villagers of Rowley, near Consett, are organising an appeal for the installation of an electric street-lighting system to replace the present oil lamps.

Saffron Walden.—REVISION OF TARIFF.—The lighting flat rate has been reduced from 8d. to 7d., and a new "all-in" two-part tariff for domestic and business premises has been introduced with a "unit" charge of 1d.

Scunthorpe.—ASSISTED WIRING.—The Urban District Council proposes to connect 1,000 of its houses to the mains under the assisted wiring scheme at a cost of £6,475.

Sheffield.—COOLING TOWER.—The Electricity Committee has obtained sanction to borrow £12,372 for the construction of a water cooling tower at the Blackburn Meadows station.

Sleaford.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £4,063 in connection with the North Road extension scheme.

Smallburgh.—L.V. LINES.—The Rural District Council has requested the Norwich Corporation to place l.v. lines at Bacton Green and Paston underground instead of overhead.

South Africa.—ELECTRICAL DEVELOPMENT.—The Electricity Supply Commission of South Africa has recently issued £2,500,000 of 3½ per cent. local registered stock at 98¼ per cent. The proceeds are for the establishment of an undertaking in the Vereeniging district, to be known as the Klip generating station which, with certain contemplated extensions, will cost £2,200,000; and also for an undertaking to be established in the Witwatersrand district and adjoining areas for the supply of power (to be known as the Rand extension undertaking) which will cost about £150,000. The remainder of the stock is to cover the cost of extensions to the Commission's existing undertakings. The whole of the output of the Klip generating station and any extensions thereto will be taken by the Victoria Falls and Transvaal Power Co., Ltd. The assets of the Commission are shown to exceed £10,203,000. Johannesburg City Council is considering a proposal to borrow £100,000 for the extension of the municipal electrical distribution system. The Town Council of Hermanus, Cape Province, is to spend £5,000 on extensions to the power station, which will include two additional transformers and an extra 100 kW machine.

South Elmsall (Yorks).—HOSPITAL EQUIPMENT.—Electromedical and X-ray apparatus are to be installed in the Warde-Aldam Cottage Hospital at a cost of £780.

Spalding.—SOURCE OF SUPPLY.—For several months the Urban District Council has been taking the whole of its electricity supplies from the Central Electricity Board through its Surfleet sub-station, which has resulted in a considerable saving, since the sub-station is only 3½ miles from Spalding as compared with 12½ from the Peterborough Electricity Department's Eye Green station. The Council has therefore informed the Peterborough Corporation that it no longer wishes to take supplies from Peterborough. A reply has been received that Peterborough Town Council will insist upon Spalding taking a bulk supply until the expiration of the agreement in 1947. This reply has been referred by the Spalding Council to a sub-committee for consideration.

Sutton Coldfield.—MAINS EXTENSIONS.—The Electricity Committee has obtained sanction to borrow £25,000 for mains extensions, and is to provide supplies at Wishaw (£1,768) and to Hill Wood (£500).

Todmorden.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to premises in Knowlwood Road (£450).

Torquay.—LOANS.—The Electricity Committee is to apply for sanction to a loan of £2,600 to enable a bulk supply to be given to Brixham Gas and Electricity Co., Ltd., at Churston Ferrers. A loan of £6,700 is required for supplies to Bigbury-on-Sea and other places in the neighbourhood. Applications are also to be made for loans of £20,000 for mains and services, and £5,000 for transformer and switchgear apparatus.

Tynemouth.—SUB-STATION.—The Electricity Committee is to erect a sub-station at Chirton Hill Farm.

Tunbridge Wells.—LOANS.—The Town Council has applied for a loan of £51,776 for mains and hire-purchase wiring.

LIGHTING IMPROVEMENTS.—The Council has decided to improve the lighting of new areas taken over by the Corporation at an estimated cost of £1,555.

Turkey.—INCREASED ELECTRICITY OUTPUT.—The Société Turque d'Electricité reports that the output of its power stations in the Istanbul area amounted during the nine months ended with September last to 70 million kWh, as compared with only 66 million kWh in the corresponding period of 1933. Since the beginning of the present year the number of consumers has increased from 32,615 to 39,275.

Wakefield.—LOAN.—The Electricity Committee is seeking sanction to borrow £25,000 for mains and services.

Wallasey.—AGREEMENT TERMINATED.—The Electricity Committee has instructed the Town Clerk to serve twelve months' notice upon Messrs. Paul Bros., and Messrs. W. Vernon & Sons, Ltd., terminating agreements entered into in 1914 and 1915 respectively, for the bulk supply of electrical energy with a view to the engineer negotiating for new terms.

Wallsend-on-Tyne.—CABLES. — The Town Council has approved plans by the North-Eastern Electric Supply Co., Ltd., for a cable in Kings Road and a telephone cable in Coronation Street.

Warrington.—POWER STATION SITE EXTENSION.—The Central Electricity Board has intimated to the Electricity Committee that it has received the approval of the Electricity Commissioners with regard to extending the site of the Corporation power station.

SUB-STATION.—The Electricity Committee has approved plans by the borough engineer for the erection of a sub-station at Barbauld Street and is seeking sanction to borrow £20,000 for mains and services.

West Bromwich.—SUB-STATION.—The Electricity Committee recommends the erection of a sub-station at Great Bridge.

Wick.—COUNCIL TO RETAIN UNDERTAKING.—The Town Council has decided to inform an interested concern that it is not desirous of selling its undertaking.

Wimbledon.—LOAN.—The Electricity Committee is seeking sanction to borrow £15,000 to purchase appliances for hiring.

Wolverhampton.—CABLE EXTENSIONS.—Mains are to be extended at a total estimated cost of £775.

STREET LIGHTING.—The Electricity Committee is to extend the street lighting system along a number of new roads on various housing estates at a total estimated cost of £2,140, and is to undertake further lighting in existing roads at a total estimated cost of £1,104.

SUPPLY IMPROVEMENTS.—A supply is being provided to Lodge Farm, Weston-under-Lizard, and that to the Thompson Avenue and district is to be improved.

Worthing.—EXTENSIONS.—The Electricity Committee is to provide a supply to Roundstone Crossing (£1,510), and Highdown Towers (£1,291). Sub-stations are to be erected at Arundel Road, Patching, and Broadmark Road, Rustington.

York.—LOAN.—The City Council has applied for a loan of £30,000 for mains and services.

Traction

Argentina.—BUENOS AIRES.—The new underground railway recently opened by President Justo was officially closed down by the Municipality on December 4th after a series of accidents and derailments.—*Reuter.*

Belgium.—RAILWAY ELECTRIFICATION.—A further 7½ miles of railway line (Antwerp to Contich) has been electrified and opened for traffic. The section between Brussels and Schaerbeek is almost completed.

Holland.—WITHDRAWAL OF DIESEL TRAINS.—A *Times* report from The Hague says that the Minister of Ways and Waterworks has replied to various questions put by members of Parliament with regard to the failure of the Diesel electric trains introduced last spring. Most of these trains, after running for about two months, have been taken out of service owing, it is stated, to trouble with the Diesel-electric motor due to vibration. The majority of the motors had proved to be seriously damaged after having run about 15,000 to 20,000 miles, and they were now being repaired. Other deficiencies of the trains were that they did not run so smoothly on the lines and became overheated. Various alterations had been made, but it was still uncertain whether the trains could be resumed.

Dundee.—FISCHER BOW FAVOURED.—Dundee is the third municipal tramway undertaking in Scotland to propose the supersession of the trolley-wheel in favour of the Fischer bow invented by Mr. Jules Fischer, chief engineer of the Budapest transport department. The bow was adopted by Glasgow three years ago and has proved an unqualified success. It has since been adopted by Aberdeen.

Hampshire.—TRAMWAY ABANDONMENT.—The Portsdown and Horndean Light Railway is to abandon its tramway system early next year.

Ipswich.—TROLLEY-BUS LOAN.—The Joint Electricity and Transport Committee, reporting on the extension of the trolley-vehicle system, states that it is anticipated that the existing fleet of vehicles will be sufficient for present requirements, but it recommends that borrowing powers shall be obtained up to a sum of £10,380 for the provision of six further vehicles when required.

Italy.—ELECTRIC RAILWAYS.—The Italian State Railways have ordered from the Breda Co., Milan, six electric trains for passenger traffic which will be capable of an average speed of 88 m.p.h., with a top speed of 100 m.p.h. Each train will comprise six undetachable carriages, forming a self-contained unit. The State Railways are developing a fast electric service for local traffic with the idea of replacing the petrol railcars now running on electrified lines.—*Financial Times.*

NEW ELECTRIC LINES.—During the past four weeks the following lines have been opened to three-phase electric traction in addition to the h.v. d.c. line from Naples to Salerno: Bolzano to Trento, 31 miles; Bolzano to Merano, 19 miles; and Ceva to Fossano, 26 miles. The last named is part of a new electric route from Genoa to Turin alternative to that via the well-known Giovi incline.

Leeds.—NEW TRAMCAR.—A new streamline tramcar is being tested by the Transport Department. The streamline design is more pronounced than that on another experimental tram now in service on the Middleton route, and the new vehicle is shorter, having only four wheels and two motors, compared with the eight wheels on the other vehicle. The motors are of a new type, obviating the use of large-resistance coils. The seats are similar to those of motor 'buses. When the tram reverses its direction the seats are reversed by means of a lever. There is seating accommodation for sixty passengers, and the driver is seated in a separate cab. It is understood that speeds of between 35 and 40 miles an hour were recorded during tests.

Morocco.—ELECTRIC RAILWAYS.—The electrification of the railway lines in Morocco is proceeding as rapidly as conditions will permit. At the present time about 310 miles of the network are electrified, amounting to almost half of the lines in operation.

Rotherham.—NEW TRAMCARS.—The transport manager recently suggested that six old-type tramcars should be replaced by five new cars at a total estimated cost of £10,000, and the Transport Committee recommends that he shall be authorised to obtain quotations from the English Electric Co., Ltd., for the supply of five single-ended tramcar bodies and from the Electro-Mechanical Brake Co. for five trucks and brake equipment, and that tenders shall be obtained for the supply of the necessary motors and electrical equipment.

South Africa.—RUBBER TRAMWAY TRACK.—It is reported that thin strips of crêpe rubber have been placed under the tramway rails in Durban. The borough engineer anticipates that the rubber will not only reduce the noise made by passing tramcars, but will also prolong the life of the track by reducing wear and tear.

Sweden.—ELECTRIFICATION OF SWEDISH RAILWAYS.—The whole distance between Stockholm and Krylbo, 161 km., of the State Railway lines will be ready for electric traffic by the end of this week, learns *Reuter's Trade Service* from Stockholm. The electrification of the State Railway line between Malmö and Angelholm, a distance of 82 km., has just been completed, and work is being continued on the remaining 217 km. of the main line connecting Gothenburg with Malmö. The Angelholm-Halmstad section, 66 km., will be electrified, it is expected, by about the middle of next year.

Switzerland.—A NEW MOUNTAIN RAILWAY.—A new electrically operated cable railway has recently been completed and put in operation between Schwyz and the tourist resort of Stoos, which lies at a height of about 4,250 ft. above sea level. According to the *Schweizerische Bau Zeitung*, the line has a length of 1,489 yards, including a bridge and two tunnels. The carriages are designed to accommodate fifty passengers and travel at a speed of just over 4¼ m.p.h. The cable, approximately 1,600 yd. long and 35½ mm. in diameter, has a safety factor of nine. It is operated by a 125-h.p. asynchronous three-phase six-pole motor, and is provided with automatic stopping gear at the terminal stations.

Traffic Signals.—Signals have been proposed at the following places: London Road and High Street, Chelmsford; George Corner, Harlow; Market Road Corner, Maldon, Essex; Cemetery Junction, Reading; Castle Road-Bushmead Avenue, Bedford; Northwich Road and Knutsford Road Swing Bridges, Runcorn; Waterden Road-Epsom Road Junction, Guildford; Maldon Road Corner, Witham; High Street-Clarence Road Junction, Grays; Dover Corner and Upminster Road Corner, Rainham; White Hart Corner and Fox Corner, Braintree; Bark Corner, Harwich; and Fighting Cocks Junction, Wolverhampton.

A complicated system of vehicle-actuated traffic signals was inaugurated at Cambridge Circus, London, on Wednesday. There are four major roads and four minor roads which enter the Circus, and the traffic on them fluctuates considerably. There are two "controllers," one on each side of the Circus, connected by cable. When the traffic is heavy they combine to pass it across in four phases, one major and one minor road being released in pairs round the Circus. If the traffic in any road decreases appreciably the controllers work independently and allow the signals to adjust themselves to the traffic demands.—*Daily Telegraph.*

Communications

Australia.—TELEPHONE INCREASE.—Figures issued by the Australian Post Office Department show the development that has taken place in the telephone service during the past ten years. Between June, 1923, and June, 1933, the number of exchanges increased from 3,010 to 6,073, telephones connected from 282,087 to 487,662, miles of wire in use from 146,550 to 2,587,391, and the number of telephones per 100 persons from 4.98 to 7.36. Mr. S. R. Roberts, Deputy Director of Posts and Telegraphs, states that the extension of publicity to embrace newspaper advertising had been attended with most satisfactory results, and that the figures registered during the past few months have been a record.

China.—TELEPHONE DEVELOPMENT.—The Shensi Provincial Government has decided to install telephones in thirty-six districts. A sum of $100,000 is to be appropriated for new equipment.

Great Britain.—RADIO RELAYS.—Northern Rediffusion Services, Ltd., has applied for permission to operate a wireless relay services at Wallsend, but the Roads and Improvements Committee recommends that no action be taken in the matter at present.

The General Purposes Committee of Stoke-on-Trent Corporation has decided not to entertain the proposal of Broadcast Listeners' Service, Ltd., to establish a station for wireless relay in the city.

Windsor Town Council has refused an application to establish a relay system in the borough.

By forty votes to sixteen, the Glasgow Corporation has decided to allow Broadcast Relay System, Ltd., London, to erect the necessary plant and wires for a relay wireless service in the city. Opposition to the proposal was led by members of the I.L.P. group, which pressed for a municipal relay service.

The Essex County Council has consented to the establishment of a wireless relay service at Hornchurch, Benfleet, and Rayleigh by the Provincial Relay Concessions, Ltd.

Members of the Radio Association in Greenock propose to establish a wireless relay system, and application has been made to the Town Council for permission to carry out the scheme. The Streets Committee recommends that the permission be granted.

Japan.—TOKIO TALKS TO WASHINGTON.—The first direct telephone communication between Japan and the United States, was inaugurated on December 8th.—*Reuter.*

Morocco.—TELEPHONE SERVICE TO AMERICA.—A *Reuter* message from Rabat states that a new telephone service will possibly be opened between Morocco and the United States, Canada, Mexico, Cuba and the Belgian Congo.

Rumania.—TELEPHONES.—A *Reuter* message from Bucharest states that Government control of the telephones, the operation of which was granted as a concession to the International Telephone and Telegraph Co., in 1930, is announced.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberdeen.—December 18th. County Council. Various works, including electrical, at housing schemes. Specifications from A. H. L. MacKinnon, architect, 245, Union Street; tenders to H. L. F. Fraser, county clerk, County Buildings.

Ashbourne.—December 21st. U.D.C. Two indoor sub-station equipments, two outdoor transformer substations, one e.h.p. switch kiosk and one pole-mounting transformer. (December 7th.) E.h.p. overhead lines and underground cable, and l.p. overhead and underground distribution and roadwork. (November 30th.)

Australia.—SYDNEY.—Municipal Council. January 14th. Supervisory control equipment for the remote control of switchgear and transformers in a 33-kV sub-station. (A.Y. 12764.)*
N.S.W. Department of Road Transport. January 28th. Traffic control equipment for nineteen street intersections. (A.Y. 12796.)*
MELBOURNE.—Posts and Telegraphs Department. January 29th. Ringing and tone equipment (vibratory type) and delayed alarm control equipment. (A.Y. 12771.)*
January 22nd. Telephone hand sets (A.Y. 12799)*. Telephone induction coils and registers. (A.Y. 12802.)*

Beckenham.—December 17th. U.D.C. Electric cookers for period from January 31st next to March 31st, 1936. (November 30th.)

Bedford.—January 10th. Beds and Northants Joint Board for the Mentally Defective. Electrical installation work at Bromham Colony. (See this issue.)

Belfast.—January 5th. Harbour Commissioners. 30-ton electrically operated gantry crane on the Albert quay. Particulars from T. N. Burke, superintendent of cranes; tenders to M. J. Watkins, general manager and secretary, Harbour Office.

Bexhill.—December 21st. Electricity Department. One 300-kVA transformer, and conversion of d.c. wireless apparatus for a.c. supply. (December 7th.)

Birkenhead.—December 17th. Electricity Department. E.h.p. metal-clad switchgear. Particulars from borough electrical engineer, Craven Street.

Birmingham.—December 20th. Public Works Committee. Automatic traffic signals at ten road junctions. Particulars from the committee.
January 3rd. Electric Supply Department. E.h.p. metal-clad sub-station switchgear, transformers and reactances, transformer oil and l.p. a.c. switchgear. (December 7th.)

Blackpool.—December 19th. Electricity Department. 6,600-V overhead line (length 2,500 yd.). (December 7th.)

Bromley.—December 24th. Town Council. Vehicle-actuated traffic signals at Bromley Common, Holmesdale Road, and Hayes Lane junction. Particulars from the borough engineer.

Buckhaven and Methil.—December 17th. Town Council. Various works, including electric lighting, at housing scheme. Schedules from P. Sinclair, architect and surveyor, Methil (£1 1s. deposit); tenders to town clerk.

Cannock.—December 17th. Electricity Department. Medium and e.h.p. cables and meters. (December 7th.)

Cardiff.—December 17th. R.D.C. Electric wiring in consumers' premises under the assisted wiring scheme from January 1st, 1935, to March 31st, 1936. Specifications from electrical engineer and manager, 20, Park Place (deposit £1 1s.); tenders to M. Warren, clerk to the Council, 20, Park Place.

China.—Government Purchasing Commission. Motor-generator sets, transformer, sliding resistances and lamps. (See this issue.)

Dorchester.—December 17th. Electricity Department. Supply and laying of p.i., l.c. steel-tape-armoured cable. (December 7th.)

Dorset.—December 17th. Public Assistance Committee. Electric lighting and fittings at the Institution, Sturminster Newton. Particulars from county architect, Dorchester.

Egypt.—CAIRO.—January 12th. Ministry of Public Works. Twelve electrically driven centrifugal pumping units and accessories. (G.Y. 14573.)*
January 16th. Two electrically driven centrifugal pumping units for Esna Barrage. (G.Y. 14572.)*

Hastings.—January 31st. Electricity Department. Electrical materials for the year ending March 31st, 1936. (December 7th.)

Heston & Isleworth.—December 21st. Electricity Department. Distribution network pillars. (December 7th.)

Irish Free State.—DUBLIN.—January 31st. Electricity Supply Board. One 20,000-kW turbo-alternator and exciter, complete with condensing and auxiliary plant. (See this issue.)

London.—H.M. OFFICE OF WORKS.—January 1st. Wiring for electric lighting, power and bells at the Imperial War museum. (See this issue.)
ISLINGTON.—January 16th. Borough Council. Electrical and engineers' stores for one year commencing April 1st, 1935. (See this issue.)

Manchester.—December 15th. Electricity Department. 114 street-lighting lanterns complete for use with electric discharge lamps, sixty weatherproof boxes, twenty-three weldless steel street-lighting standards, and seventy-two brackets. Particulars from H. C. Lamb, Electricity Department, Town Hall.

Morecambe & Heysham.—Electricity Department. Medium-pressure cables. (December 7th.)

Newton-in-Makerfield.—December 17th. Electricity Department. 400-kVA and 20-kVA transformers and 11-kV circuit-breaker. (November 23rd.)

New Zealand.—CHRISTCHURCH.—Drainage Board. April 5th. Three electrically driven sewage pumping sets, with starters, pipes, valves, &c. (G.Y. 14505.)*
Five panels of switchgear for supply to a pumping station. (A.Y. 12795.)*
WELLINGTON.—Posts and Telegraphs Department. February 13th. Power relays. (A.Y. 12780.)*
February 25th. Enamelled copper wire. (A.Y. 12804.)*
Public Works Department. February 19th. 50-kV outdoor switchgear, including steelwork, for Henderson sub-station. (A.Y. 12758.)*
March 5th. Seven 8,000-kVA transformers. (A.Y. 127577.)*

Northampton.—December 17th. Town Council. Electric lighting in 1,050 houses (eleven tenders). Particulars from the borough engineer.

Oban.—December 21st. Town Council. Electric lighting at housing scheme. Specifications from D. Galloway, borough surveyor; tenders to town clerk.

Selby.—December 17th. Electric lighting at Girls' High School. Particulars from education officer, County Hall, Wakefield; tenders to Sir J. Charles McGrath, clerk of County Council, Wakefield.

South Africa.—JOHANNESBURG.—January 29th. Electricity Supply Commission. Steam-raising plant, steam turbine-driven alternators, and three feed pumps and feed heaters and surge tanks. (G.Y. 14522.)*

Southend-on-Sea.—January 3rd. Electricity Department. Transformers. (See this issue.)

Swindon.—December 21st. Electricity Department. 6.6-kV, p.i., l.c. and armoured cables. (December 7th.)

Tasmania.—HOBART.—Hydro-Electric Commission. January 7th. Metering equipment. (A.Y. 12774.)*

West Riding.—December 17th. County Mental Hospitals Committee. Three-wire balancer for generating plant at Wakefield Mental Hospital. Particulars from W. E. H. Burton, architect and engineer to the Board, Wakefield.

Witney.—January 2nd. Electricity Department. 11-kV switchgear, indoor, oil-immersed, three-phase transformers, and l.p. distribution fuseboards. (November 30th.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barnoldswick.—Education Committee. Recommended. Electric lighting installation at schools: Gisburn Road, A. Lister; Rainhall Road, H. Broughton.

Barrow-in-Furness.—Electricity Committee. Recommended. Switchgear extensions (£5,584).—Metropolitan-Vickers Electrical Co., Ltd.

Brighton.—Electricity Committee. Recommended. Boiler plant for Southwick power station (£57,956).—Stirling Boiler Co., Ltd.

Cardiff.—Electricity Committee. Accepted. Bus-bar section switch (£2,654).—General Electric Co., Ltd.

Carlisle.—City Council. Accepted. Electrical work in connection with the building of new electricity showrooms in Castle Street (£306).—Ridley & Gardiner.

Clacton-on-Sea.—Urban Council. Accepted. Electrical materials required for Towers Hotel.—Crompton Parkinson, Ltd. (£370); Edison Swan Electric Co., Ltd. (£325).

Dover.—Town Council. Accepted. Alterations to and replacement of apparatus on consumers' premises (£1,921).—Phillips & Sons, Electrical, Ltd. Rewiring at the water works (£169).—Bowles & Son.

Isle of Man.—Electricity Board. Accepted. Rectifying plant.—Hewittic Electric Co. Oil switches.—Crompton Parkinson, Ltd. Transformers and switches.—Johnson & Phillips, Ltd.

Leeds.—Electricity Committee. Accepted. Cables.—Edison Swan Cables, Ltd. (£1,907); Macintosh Cable Co., Ltd. (£1,692); W. T. Henley's Telegraph Works Co., Ltd. (£1,092); Telegraph Construction & Maintenance Co., Ltd. (£773); Enfield Cable Works, Ltd. (£230); Metropolitan Electric Cable & Construction Co., Ltd. (£251).
Assistance Committee. Accepted. Electric lift repairs at Institution (£184).—G. Porteus & Sons (Leeds), Ltd.

Manchester.—Electricity Committee. Accepted. Frequency control equipment at Stuart Street station.—Metropolitan-Vickers Electrical Co., Ltd.
City Council. Accepted. Electrical work at the Mansfield Street and Atherton Street municipal schools.—S. H. Heywood & Co., Ltd.

Reading.—Electricity Committee. Accepted. Transformers in connection with bulk supply from the Central Electricity Board (£6,735).—Brush Electrical Engineering Co., Ltd.

Reigate.—Town Council. Accepted. Kiosk and transformer (£389).—Park Royal Engineering Co., Ltd.

Scarborough.—Town Council. Accepted. Electrical installations at 110 houses on the Mount Pleasant Estate (£510).—G. Biggs & Son.

Shoreham.—Brighton, Worthing and Hove Joint Aerodrome Committee. Accepted. Electrical installations at airport (£3,228).—B. French, Ltd.

Sleaford.—Electricity Committee. Recommended. Sub-station kiosk and equipment (£702).—A. Reyrolle & Co., Ltd. L.p.

mains, &c. (£1,192).—Callender's Cable & Construction Co., Ltd.

Swansea.—Electricity Committee. Accepted. Turbo-alternator and condenser for the Tir John power station.—Brush Electrical Engineering Co., Ltd.

Tunbridge Wells.—Town Council. Accepted. E.h.p. three-phase sub-station at Southborough pumping station.—Crompton Parkinson, Ltd. Lanterns, metal-clad condensers and choke coils.—General Electric Co., Ltd. Solar synchronous time switches.—Venner Time Switches, Ltd.

Wimbledon.—Electricity Committee. Recommended. 200-kW Diesel generator (£1,963).—Davey, Paxman & Co. (Colchester), Ltd.

Forthcoming Events

Birmingham Electric Club.—Friday, December 14th. Grand Hotel, Birmingham. 7 p.m. Annual general meeting.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, December 15th. South Wales Institute of Engineers, Cardiff. 6 p.m. Discussion of H.M. Electrical Inspectors' Report.

Institution of Electrical Engineers.—Monday, December 17th. Institution, London. 7 p.m. Informal meeting. Discussion on "Modern Fuse Protection." To be opened by Mr. J. F. Shipley. Thursday, December 20th. 6 p.m. "The Organisation of Electricity Supply in New Zealand." Mr. F. T. M. Kissel. (*Dundee Sub-Centre*).—Friday, December 14th. University College, Dundee. 7.30 p.m. "The Cathode-Ray Tube and Its Applications." Mr. G. Parr. (*London Students' Section*).—Monday, December 17th. Storeys Gate, S.W. 6.45 p.m. Joint meeting with the Institution of Mechanical Engineers Graduates, "The Overhaul of Electric Railway Stock." Mr. E. McEwen. (*North-Eastern Students' Section*).—Friday, December 14th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Impromptu speech night. Saturday, December 15th. 2.30 p.m. Joint visit to the N.E. Coast Institution of Engineers and Shipbuilders Graduates, to the works of Messrs. Clark Chapman, Gateshead-on-Tyne. (*South Midland Students' Section*).—Friday, December 14th. Boot's Café, Birmingham. 7.45 p.m. Annual dance. (*Tees-side Sub-Centre*).—Monday, December 17th. Cleveland Technical Institute, Middlesbrough. 6.45 p.m. "Generation, Distribution and Use of Electricity on Board Ship." Messrs. C. W. Saunders, H. W. Wilson, and R. G. Jakeman. (*Western Centre*).—Monday, December 17th. The Guildhall, Gloucester. 6 p.m. Paper on the heating of large buildings, by Messrs. R. Grierson and D. Betts. (*North Western Centre*).—Tuesday, December 18th. Engineers' Club, Manchester. 7.15 p.m. Joint meeting with the Manchester Association of Engineers and Institution of Mechanical Engineers. *N.W. Branch.*—"Hydro-Electric Development in Great Britain." Messrs. A. S. Valentine and E. M. Bergstrom. (*Transmission Section*).—Wednesday, December 19th. Institution, London. 6 p.m. "The Control of Voltage and Power Factor on Interconnected Systems." Mr. O. Howarth. (*West Wales* (*Swansea*) *Branch*).—Thursday, December 20th. Electric House, Swansea. 6.30 p.m. "The Application of Electricity to the Coal Face." Mr. G. Rutter.

Association of Supervising Electrical Engineers.—Tuesday, December 18th. Brettenham House, W.C.2. 7.15 p.m. "Earthing for Protection." Mr. T. C. Gilbert.

Institution of Civil Engineers.—Tuesday, December 18th. Institution, London. 6 p.m. Papers on hydro-electric power schemes by Messrs. B. Manne Hellstrom and W. J. Horsburgh Rennie.

Diesel Engine Users' Association.—Wednesday, December 19th. Caxton Hall, S.W.1. 3 p.m. "The Development and Progress of the High Speed Diesel Engine in Road Transport." Major W. H. Goddard.

Edinburgh Electrical Society.—Wednesday, December 19th. Philosophical Institution, Edinburgh. "Automobile Electricity." Mr. J. H. Irving.

Junior Institution of Engineers.—Friday, December 21st. Institution. London. 7.30 p.m. Informal meeting. "Regulations and Rules Affecting Luminous Discharge Tube Installations." Mr. E. H. Whatton.

Rugby Engineering Society.—Friday, December 21st. Annual reception and ball.

Notes

An E.P.E.A. Dinner Dance

The West Yorkshire Section of the Electrical Power Engineers' Association held its twelfth annual dinner-dance at Leeds on December 7th. Mr. J. F. Sarvent (resident engineer at the Kirkstall power station, chairman of the branch) presided, and he was accompanied by Mrs. Sarvent. In proposing the toast of "The Association" the Lord Mayor of Leeds said it spoke well for the organisation that its membership was as high as 90 per cent. In responding, the president, Mr. R. H. Toynbee (Leeds), touched on the educational side of the service which the Association had rendered to the industry. A toast to the "Ladies and Guests" was proposed by Mr. G. A. Vowles (Halifax) and responded to by Prof. E. L. E. Wheatcroft (Leeds). At the conclusion of the dinner dancing followed and a cabaret was also given. The organising arrangements were in the hands of Mr. J. Ross Wilson, social secretary.

The Association of Consulting Engineers

The annual dinner of the Association of Consulting Engineers, held at St. Stephen's Club on December 5th, was presided over by the chairman of the committee of the Association, Mr. J. D. Watson (vice-president Inst. C.E.). The toast of "Kindred Institutions" was proposed by C. L. Humphreys, who referred to the value of rules of conduct to a professional body for the maintenance of its self-respect. In response, Sir Richard Redmayne (president Inst. C.E.) referred to the honour in which the Association was held by the senior engineering institutions, and Mr. Arthur Collins (past-president Inst. of Municipal Treasurers and Accountants) paid further tribute to the standing of the Association among public authorities. Sir Alexander Gibb (vice-president Inst. C.E.) proposed "Government Officials," to which Sir Cyril Hurcomb (permanent secretary, Ministry of Transport) and Mr. I. G. Gibbon (Ministry of Health) replied. "The Association of Consulting Engineers" was proposed by Lord Craigmyle and responded to by the chairman.

Salt Interrupts Transmission

A deposit of salt, wind-borne from the sea, at the Portobello grid sub-station, Edinburgh, affected three transmission lines on December 7th. According to Mr. E. J. Seddon, manager of the Edinburgh Electricity Department, the deposit caused flashovers and some of the insulators collapsed. Lines to Hamilton, Galashiels and Glasgow were impaired, the output being automatically cut off in each case so that no danger arose. The trouble was remedied the same day.

Generation of Electricity

The official returns rendered to the Electricity Commissioners show that 1,595 million kWh of electricity was generated by authorised undertakings in Great Britain during November, as compared with the revised figure of 1,421 million kWh in the corresponding month of 1933, representing an increase of 12.2 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-six, the same as last year. During the first eleven months of 1934 up to the end of November, the total amount of electricity generated by authorised undertakers was 13,902 million kWh as compared with the revised figure of 12,025 million kWh for the corresponding period of 1933, representing an increase of 15.6 per cent.

	1933. kWh. (millions).	1934. kWh. (millions).	Inc. per cent.
January	1,336	1,536	14.8
February	1,151	1,343	16.5
March	1,160	1,390	19.6
April	952	1,187	24.5
May	1,005	1,125	11.9
June	885	1,049	18.5
July	913	1,042	14.1
August	928	1,059	14.1
September	1,023	1,142	11.6
October	1,245	1,434	15.2
November...	1,421	1,595	12.2

South African Institute of Electrical Engineers

For the second year in succession the Governor-General of South Africa, the Earl of Clarendon, attended the annual dinner of the South African Institute of Electrical Engineers. The British High Commissioner in the Union, Sir Herbert Stanley, also attended, together with Mr. O. Pirow, Minister of Defence. Mr. R. H. Gould, the president, said he hoped for official recognition of the Institute by the Government.

Electricity in Mines

Mr. A. Ernest Brown, secretary for Mines, was the principal speaker at the annual reunion dinner on December 1st at Glasgow of the West of Scotland branch of the Association of Mining Electrical Engineers. Proposing the toast of the Association, he said at no other time in all its long history was the industry faced with more complex and more perplexing problems. The latest figures of electrical equipment in British mines at June 30th, 1934, showed the number of electric motors to be 45,342, and their aggregate horse-power to be 1,022,104 h.p. below ground and 927,082 h.p. above ground. As the use of electricity underground mounted and the machine got a greater grip upon the pulse of industry they would need a more qualified type of man to secure an increasing measure of safety for the workers below ground. Mr. H. J. Fisher, president of the Association, replied, and said that the Association was fully alive to the problems confronting them in the way of better lighting and safety in the mines. They had a committee which considered a variety of questions affecting mine safety, and as a result of the meetings of this committee several systems had been evolved.

Appointments Vacant

Professor of Electrical Engineering, for the College of Engineering, Guindy, Madras, India.

District engineers for Northern Ireland Electricity Board.

Assistant mains superintendent for City of Carlisle.

Engineering and distribution assistant for Wolverhampton Electricity Department.

Temporary assistant mechanical and electrical engineer for the Air Ministry.

(See our classified advertisements.)

Makers' Names Wanted

BERESFORD STORK electrically driven pump.
TRIUMPH FOCUSLITE cinema or spotlight outfit.
BURRO machine for steaming barley.
REDMUND rotary switch.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. S. Blackman, whose forthcoming retirement was announced in our issue of July 20th, was presented with a clock, suitably inscribed, on December 7th by the North-East England Local Centre of the Incorporated Municipal Electrical Association at the Sunderland Corporation electricity offices. The local Centre came into being through Mr. Blackman's efforts. He was one of the first managers in the country to introduce a rate for dwelling houses consisting of a fixed charge plus ½d. per kWh. He has always been a strenuous municipal man, and has been a member of the Council of the Incorporated Municipal Electrical Association for sixteen years; he was vice-president in 1921. In 1925 he gave evidence before the Royal Commission on Mining Subsidence as affecting electricity mains, and in 1917 before the Board of Trade Committee on Electric Power, presided over by Sir Archibald Williamson. The report of this Committee subsequently led up to the grid. The presentation was made by Mr. C. Turnbull, electrical engineer of Tynemouth.

Sir Duncan Watson is the president of the Royal Warrant Holders' Association which is to build, equip, furnish and endow a house, to be known as the King's House, for presentation to the King as a Jubilee gift. A replica of the house will be shown at Olympia during the Ideal Home Exhibition in March next.

Mr. J. Turner, A.M.I.E.E., has been appointed by the Government of the Punjab, as maintenance and test engineer in the Electricity Branch of the Punjab Public Works Department.

Mr. William McLellan, of Messrs. Merz & McLellan is retiring from partnership in the firm on December 31st next.

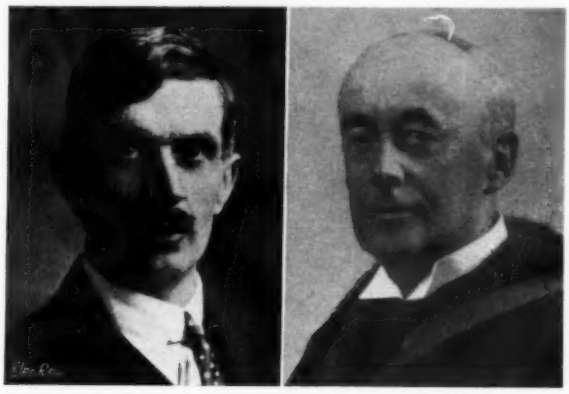
Mr. A. Latham, distribution engineer in the Wolverhampton Corporation Electricity Department, has been appointed chief assistant electrical engineer to Mr. R. H. Harral in the Blackburn Corporation Electricity Department. Mr. Latham was educated at Southport and received his training in the generating station and the mains department of the Southport Corporation electricity undertaking, subsequently serving as mains assistant with that undertaking. In August, 1926, he was appointed district engineer with the Electricity Distribution of North Wales & District, Ltd., and was in charge of a large area in South Cheshire and North Shropshire. He was appointed to his present position as distribution engineer with the Wolverhampton Corporation in October, 1930, and has been responsible for an extensive rural development scheme at a cost of £27,000, and the carrying out of several other schemes in connection with the general distribution system. During his period of service at Wolverhampton the number of consumers has been doubled, and the kWh output has increased by over 40 per cent.

Mr. A. Latham

Ald. H. K. Beale was reappointed chairman of the South-West Midlands Advisory Joint Committee at a meeting held on December 6th. He has held this position since the Committee was established in June, 1923.

Mr. D. Winton Thorpe, A.M.I.E.E., has entered into a working association with Messrs. Waldo, Maitland & Partners, lighting consultants.

Ald. J. Chuter Ede, J.P., D.L., has been elected chairman and **Ald. D. Stuart,** M.I.E.E., vice-chairman of the London and Home Counties Joint Electricity Authority for the ensuing period of three years. Ald. Chuter Ede was educated at Epsom National and Dorking High Schools and, after serving his apprenticeship as a teacher under the late London School Board, at Christ's College, Cambridge. In 1908 he was elected to the Epsom Urban District Council and became chairman of its Electricity Committee in 1909. He served on this Council, with an absence during the War, when he enlisted in the 5th East Surrey Regiment, and subsequently transferred to the Royal Engineers, until 1927. He was re-elected in 1933, and is now chairman of the Water Committee. He was chairman of the Council from 1920 to 1922. He was elected to the Surrey County Council in 1914, and was elected a county alderman in 1925, becoming vice-chairman of the Council in 1930 and chairman in 1933, to which office he was re-elected in March last. In 1923 Mr. Ede won a by-election for the Labour Party at Mitcham, when he defeated the Minister of Health. He is regarded as an authority on local administration, especially on educational matters. Ald. Stuart is an ex-mayor of Wimbledon, of which Corporation he has been a member since 1907. He is chairman



[Russell & Sons, Wimbledon

Ald. J. Chuter Ede **Ald. D. Stuart**

of the Finance Committee and was formerly chairman of the Electricity and Education Committees. Until his retirement he was on the head office staff of the Engineer-in-Chief of the Post Office, and was formerly on the staff of the United Telephone Co. and the National Telephone Co. He took part in the arbitration proceedings in connection with the acquisition by the Government of the last-named company.

Mr. Temple Davies, who is leaving Plymouth to take up the appointment of chief technical assistant to the Stepney Borough Council, was presented with an antique cabinet by the staff and workmen of the Plymouth Corporation Electricity Department, at the annual dinner and dance of the Department held on December 8th at the Continental Hotel, Plymouth. The presentation was made by Ald. W. J. Modley, chairman of the Electricity and Street Lighting Committee, supported by the city electrical engineer (Mr. H. Midgley), who paid tribute to Mr. Davies's work during the past three years.

Mr. R. A. West has been appointed mains assistant to the Epsom and Ewell Urban District Council. He has been with the Grimsby Corporation Electricity Department for the past nine years, the last two years as an assistant district engineer.

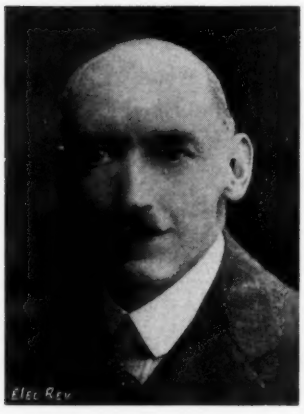
Mr. Percy Lister, who for the past ten years has acted as managing director of Messrs. R. A. Lister & Co., Ltd., of Dursley (Glos), has been appointed chairman of the company in succession to the late Mr. Austin Lister.

Mr. F. Favell, A.M.I.E.E., A.M.I.Mech.E., Whit.Exh., was selected from forty-eight applicants for the position of chief engineer and manager by the North-West Midlands Joint Electricity Authority at its meeting on December 6th. Mr. Favell received his technical training at the Lincoln Technical College and later at the Manchester College of Technology, and his works training with Messrs. Robey & Co., Ltd., Lincoln. He went to Stoke-on-Trent at the end of 1927 as engineering assistant to Mr. C. H. Yeaman, the city electrical engineer, was promoted to station superintendent in 1929, and was taken over by the North-West Midlands Joint Electricity Authority when it was formed in 1930. In 1932 he became generation engineer in charge of the Stoke-on-Trent and Stafford generating stations. Previous to 1927 he held appointments with the Battersea Borough Council Electricity Department and with Messrs. Henry Simon, Ltd., of Manchester. He will take up his new duties in January.

Mr. F. Favell

Obituary

Mr. A. F. Harris.—We regret to record the death of Mr. Arthur Frederick Harris, managing director of Nalder Brothers & Thompson, Ltd. He was at the works of the company at Dalston as recently as Monday, December 3rd, and he died on Friday morning last, at the age of sixty, after only three days' illness, at 14, Lansdown Road, Sidcup. Thirty-five years ago Mr. Harris, who was educated at Eastbourne College and at the Central Technical College at Kensington, joined the company mentioned, and he was appointed a director in 1904. He became managing director in 1929, and later chairman and managing director, holding this appointment up to the time of his death. The company celebrated its jubilee in June last. Mr. Harris became an associate of the Institution of Electrical Engineers in 1895, an associate member in 1903, and a full member in 1929. He had a lengthy association with the B.E.A.M.A., of which he was a member of council, and on a number of whose technical and advisory committees he served. He was married in April last to Miss Lilian McCalman. The funeral service took place on Monday at Holy Trinity Church, Lamorbey, Sidcup, and the interment followed at Sidcup Cemetery.



The late Mr. A. F. Harris

Mr. G. E. Watt.—The death has occurred at the age of sixty-six of Mr. George Edwin Watt, The Kyles, Llandaff, a well-known electrical engineer in South Wales. Mr. Watt was with the Metropolitan-Vickers Electrical Co., Ltd., until his retirement in 1926. He was a member of the South Wales Institute of Engineers.

Mr. C. E. Lacy-Hulbert.—The death occurred on December 8th, after a very short illness, of Mr. Charles Edward Lacy-Hulbert, founder and managing director of Messrs. Lacy-Hulbert & Co., Ltd. He died at his home at Warlingham, Surrey at the age of sixty-six.

Mr. Bernard L. Myers, for over thirty years lecturer in electro-technology at the Holt Technical School, Birkenhead, died at his home in Liverpool on Monday last.

Herr L. Datterer.—The death is reported from Munich, at the age of eighty-two, of Herr Ludwig Datterer, for many years chief engineer of the Berlin municipal electricity system.

Wills.—The late **Mr. A. H. Hopkinson,** O.B.E., for some years a director of Hopkinsons, Ltd., left £254,148 (net personalty £245,312).

Mr. F. W. Davis, M.Inst.C.E., A.M.I.E.E., for thirty-five years director and engineer of the Cleveland Bridge & Engineering Co., left £58,589 (net personalty £53,407).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

B.E.T. Electricity Supply Co., Ltd.—Public company. Registered December 8th. Capital, £750,000 in £1 shares. Objects: To make such arrangements and enter into such (if any) agreements as the board think proper for the purpose of acquiring from the British Electric Traction Co., Ltd., shares and debenture stock of the Birkdale District Electric Supply Co., Ltd., Lewes and District Electric Supply Co., Ltd., Merthyr Electric Traction and Lighting Co., Ltd., Penarth Electric Lighting Co., Ltd., Sheerness and District Electric Supply Co., Ltd., Weston-super-Mare and District Electric Supply Co., Ltd., Wisbech Electric Light & Power Co., Ltd., and Antrim Electricity Supply Co., or any of them, to generate and supply electricity, &c. The first directors are: R. J. Howley, 12a, Maddox Street, W. (director and deputy chairman of the British Electric Traction Co., Ltd.); P. M. Rossdale, Fourways, Slindon, Sussex (director of British Electric Traction Co., Ltd.); W. P. Gauvain, Downsgate, Tadworth, Surrey (director and chairman of Birkdale District Electric Supply Co., Ltd.); and H. Bentham, 38, Birchington Road, N.8. The directors' borrowing powers are restricted to a sum not exceeding the nominal amount of the issued capital. Solicitors: Sydney Morse & Co., 1, Aldersgate Street, E.C.

Ebonestos Holdings, Ltd.—Public company. Registered December 3rd. Nominal capital, £100 in 5s. shares. Objects: To adopt an agreement with the British Homophone Co., Ltd., and to carry on business as manufacturers of and dealers in ebonite, bakelite, dynamos, motors, armatures, magnetos, batteries, conductors, insulators, transformers, convertors, switchboards, stoves, cookers, insulating materials, &c. The following are directors: W. D. Sternberg, Mondesfield, Exeter Road, Brondesbury, N.W.2, J. Halsby, 30, Southwood Avenue, N.6, and H. H. Fletcher, 25, Gerard Road, Harrow. Registered office: 381-399, Salisbury House, London Wall, E.C.

Marzola Heater Co., Ltd.—Public company. Registered in Edinburgh December 4th. Capital, £25.000 in 5s. shares. Objects: To carry on the business of general heating and electrical engineers, manufacturers of electrical appliances and devices, ironfounders and moulders, domestic engineers, tool manufacturers, &c. The directors are: J. A. Ferguson, Westercraigs, Dennistoun, Glasgow, C.1; and J. O. Marcelais, 2, Wardlaw Road, Bearsden, Dumbartonshire. Registered office: 150, Hope Street, Glasgow, C.2.

London Transformer Products, Ltd.—Private company. Registered December 6th. Capital, £2.500 in £1 shares. Objects: To acquire as from October 31st, 1934, the business of general engineers carried on at 368, High Road, Willesden Green, N.W.10, by H. B. Lyle and F. S. Lyle as London Transformer Products Co. The permanent directors are: H. B. Lyle, "Rodwell," 4, Ambleside Road, N.W.10, and two others. Registered office: 368, High Road, Willesden Green, N.W.10.

Vactric, Ltd.—Public company. Registered December 4th. Capital, £200.000 in 100,000 6 per cent. cumulative redeemable preferences shares of £1 each 400,000 ordinary shares of 5s. each. Objects: To adopt an agreement with Vacuum Cleaners, Ltd., to develop and turn to account the business and property and assets comprised therein; also to adopt agreements with C. T. Pegley, A. J. Pegley, and W. C. Pegley, relating to management; and to carry on the business of makers of vacuum cleaners, electricians, electrical, mechanical, sanitary, gas and water engineers, ironmongers, manufacturers of and dealers in dynamos, motors, telephones, bells, electroliers, arc and other lamps, electric light fittings, heating and cooking apparatus. The first directors are: S. K. Tubbs, 34, Manor Road, Barnet; E. C. Stacey, The Priory, Eynsford, Kent; C. T. Pegley, 32, Valley Drive, Kingsbury, N.W.9; A. J. Pegley, 26, Valley Drive, Kingsbury, N.W.9; W. C. Pegley, 32, Mersham Drive, Kingsbury, N.W.9. The last three are directors of Vac-Tric, Ltd. Secretary: Andrew T. Lewis. Solicitors: Edward F. Iwi, 5 & 6, Clements Inn, W.C.2.

Lighting, Heating & Traction Supplies Co., Ltd.—Referring to the registration of this company, reported in our last issue, the company states that it has been formed to carry on the business of electrical engineers, wholesale factors and agents, not contractors as stated in our note.

Universal Electrical Laboratories, Ltd.—The address of this company is Mora Works, 91, Mora Road, Cricklewood, N.W.2, not Union Road as stated in our last issue.

Returns of Electrical Companies

West India & Panama Telegraph Co., Ltd.—Satisfaction to the extent of £90,000, on December 31st, 1911, March 11th, 1925, and November 19th, 1934, of first mortgage debentures authorised by resolutions of May 13th, 1891, December 14th, 1891, and December 15th, 1920, and registered September 29th, 1903, and February 1st, 1921. Debentures aggregating £10,000, were never issued, but were shown as issued in error in particulars filed February 1st, 1931. These unissued debentures are now cancelled and the whole series satisfied.

Radiovisor Parent, Ltd.—Satisfaction on November 22nd, 1934, of debenture in favour of British Mutual Banking Co., Ltd., dated August 24th, 1932, and registered August 24th, 1932. (According to the register of mortgages, the debenture registered August 24th, 1932, originally secured all moneys due or to become due, not exceeding £10,000.)

Vincent Switchgear Mfg. Co., Ltd.—Capital, £10,000 in £1 shares. Return dated September 26th, 1934. 7,948 shares taken up. £7,948 considered as paid. Mortgages and charges, £3,000.

Holophane, Ltd.—Capital, £100,000 in £1 shares. Return dated October 12th, 1934. All shares taken up. £7 paid, £99,993 considered as paid. Mortgages and charges, nil.

Stella Conduit Co., Ltd.—Capital, £20,000 in £1 shares. Return dated November 6th, 1934. All shares taken up. £20,000 considered as paid. Mortgages and charges, nil.

Electrical Finance & Securities Co., Ltd.—Satisfaction to the extent of £4,594 on October 31st, 1934, of trust deeds dated July 29th, 1927, July 6th, 1928, April 24th, 1930, and January 29th, 1932, and registered July 29th, 1927, July 10th, 1928, April 29th, 1930, and February 1st, 1932, respectively.

Leominster Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £12,000 in £1 ordinary shares beyond the registered capital of £11,000.

Strange & Sons Electrical Engineering Co., Ltd.—Capital, £200 in £1 shares. Return dated November 30th, 1934. 116 shares issued and fully paid up. Mortgages and charges, nil.

British Loewe Manufacturers, Ltd.—The nominal capital has been increased by the addition of £900 in £1 ordinary shares beyond the registered capital of £100.

Barker Young & Co., Ltd.—Satisfaction in full on September 22nd, 1933, of debenture in favour of Barclay's Bank, Ltd., dated July 30th, 1931, and registered August 7th, 1931. (Notice filed December 1st, 1934.) (According to the register of mortgages, the debenture registered August 7th, 1931, originally secured all moneys due to bank.)

Anderson, Angell & Co., Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £6,000.

City Notes

Crompton Parkinson, Ltd., held their annual meeting on December 7th, Mr. Frank Parkinson (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, November 30th, p. 773) the chairman said that during the time which had elapsed since the company was constituted in its present form, in 1927, there had been a continuous extension of their activities in many directions, as a result of which their total business had more than trebled in the seven years, and was still expanding. Throughout this period they had consistently adhered to the policy of specialising in various lines of manufacture so that every product might be made on a large scale by the most efficient method, and concurrently to undertake the manufacture of additional products as opportunity occurred. Their efforts were continuously directed to securing still higher standards of quality with still greater economies in cost of production. Their trading results through the period of the "slump" had reflected the soundness of this policy, and in spite of industrial depression they had been able to maintain a reasonably satisfactory profit-earning capacity. The trading conditions during the financial year just closed had shown some sign of improvement, but looking at the world markets as a whole it was evident that considerable further improvement was necessary before they would experience a return to normality. They had entered a new field by the establishment of an organisation for the manufacture and installation of automatic fire-protection equipment. For this purpose they had formed a subsidiary company — Atlas Sprinkler Co., Ltd.—and had equipped and organised new works for the manufacture of this apparatus. The manufacture and sale of electric lamps continued to make satisfactory progress. The new glass works were in full operation, and the Crompton lamp was selling in ever-increasing quantities in twenty-four countries throughout the world. During the year steady progress had been made in the sale of Derby electric cables and wires in home and overseas markets, and the works and plant at Derby had been further extended to cope with the increased demand. The works of the British Electric Transformer Co., Ltd., had been kept well occupied during the year, and the reorganisation had resulted in an increased profit being made. In addition to the general business they had manufactured several large transformers for the grid. During the year they had built and delivered one of the largest transformers ever shipped to Australia. Their transformer business in other parts of the world also showed steady improvement. Their electric traction department had been active and a number of important contracts were in hand. In addition to recommending the continuance of the dividend and bonus policy agreed last year, the improved trading results justified them in recommending an additional special bonus of 2 per cent. for the year, thereby increasing the bonus to 7 per cent., as compared with 5 per cent. last year. They were extending the scope of their superannuation fund so that all employés of the company and of its subsidiary and associated companies might enjoy the benefits of the scheme.

Mr. F. Parkinson

Vactric, Ltd., has been before the public this week with a prospectus inviting subscriptions for an issue of 100,000 6 per cent. cumulative preference shares of £1 each at par and 100,000 ordinary shares of 5s. each at 12s. 6d. per share. 300,000 ordinary shares will be allotted to the vendors at par in part payment of the purchase price. Particulars of the registration of the company will be found on the preceding page. The prospectus gives figures indicating the rate of progress in the sales of vacuum cleaners during the last five years and the growth of production facilities and operations at Cricklewood. The profits of the purchased business for three years to March, 1932, 1933 and 1934 were £8,373, £11,213 and £30,295 respectively, and for the half-year ended September, 1934, £30,148. These figures included certain refrigerator business, but this section was discontinued last January and the assets relating thereto were sold. The net profits for the current year are estimated to exceed £50,000, and it is further stated that the surplus profits available for reserve and dividends on the ordinary shares will be over 38 per cent. per annum. The purchase price being paid for the business and assets figures at £205,182, of which £137,500 is for goodwill. After deducting the ordinary share premium the goodwill will stand in the books at £100,000. The list closed on Tuesday, the issue having been heavily oversubscribed.

Tube Investments, Ltd., held its annual meeting on December 5th, when Mr. A. Chamberlain (chairman) in the course of his speech said that there was a substantial increase in turnover during the year under review in every department of their activities, particularly in their three main branches—tubes, electrical accessories and cycle accessories. They proposed to bring their issued capital more into line with their employed capital by capitalising £252,000 and distributing this sum in the form of ordinary shares in the proportion of one ordinary share in ten. The report and accounts were adopted and a resolution was passed for the capitalisation of £252,757 from the reserve.

The London & Home Counties Joint Electricity Authority issued the prospectus on December 10th of the issue at 97½ of £1,000,000 3¼ per cent. stock. The proceeds of the issue will be applied towards the repayment of temporary loans raised for the development and extension of the electricity undertakings acquired by the Authority in the counties of Middlesex and Surrey, in the further extension of these undertakings and for other purposes. Repayment of the principal will be made at par in 1975, but the Authority has the option to redeem the stock, in whole or in part, in or after 1955 at par.

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., reports a net profit for the year ended September 30th last of £26,053, as compared with a loss of £46,226 in the preceding year. It is proposed to pay the dividend of 5½ per cent. on the preference share capital for the year, to place £5,000 to contingencies reserve, and to carry forward £7,303. Trading at Persan ceased in July last, and the greater part of the assets there have now been disposed of on a basis which leaves the company a minority interest in a new French company formed to take over the land and buildings. The improved results reflect the benefits derived from the new methods of management introduced during the current year under the scheme of reorganisation carried through in November, 1933. Meeting: December 17th.

Enfield Rolling Mills, Ltd., reports a net loss for the year ended December 30th last of £32,146, as compared with a profit of £2,213 for 1932-33. After allowing for £2,903 brought in, a debit balance of £29,243 is carried forward. The report states that it has taken longer to bring the new plant into commission than was anticipated. Four of the six departments are in full operation, but it will be a few months before economic production is reached in the remaining two. During the year 125,000 £1 ordinary shares were issued, the premium received by the company amounting to £40,650. Of this £19,999 has been utilised for extinguishing the patent rights item, in writing off the increase of capital expenses, and in writing down the research and development expenditure by £13,870. Meeting: December 20th.

Mann, Egerton & Co., Ltd., report a profit for the year ended September 30th last of £32,334. It is proposed to pay a dividend of 1s. per share on the ordinary 11s. shares, to place £10,000 to general reserve, and to carry forward £16,187.

The Amazon Telegraph Co., Ltd., reports a profit for the year ended June 30th last of £7,178, which with £10,061 brought in makes £17,239. The directors state that the Brazilian Government has so far withheld payment of £12,843 of the year's subsidy pending a settlement of an outstanding claim which is not admitted by the company. It is therefore considered advisable to carry forward the whole of the balance on revenue account.

The British Power & Light Corporation (1929), Ltd., is offering to shareholders 400,000 6 per cent. cumulative preference £1 shares at 28s. 9d. each. The capital is required to purchase the preference shares of the Electricity Distribution of North Wales & District, Ltd., and for extinguishing a bank overdraft.

Edmundson's Electricity Corporation, Ltd., reports that the results of its group of companies during November, as compared with the corresponding month of 1933, show an increase of 17 per cent. in kWh sold.

The British Electric Traction Electricity Supply Co.—It is announced that £350,000 of this company's 4 per cent. debentures have been placed privately.

The Brazilian Traction, Light & Power Co. has declared a quarterly dividend of 1½ per cent. on the preference shares.

Stocks and Shares

TUESDAY EVENING.

The London and Home Counties J.E.A. has been in the market this week with an issue of £1,000,000 of 3¼ per cent. stock offered at 97½. The running yield comes to £3 6s. 8d. per cent., and allowing for redemption the return is a few pence per cent. more. The stock is dated 1955-1975, and the money is wanted in order to provide for repayment of temporary loans, and for further expansion of business. The stock is a gilt-edged investment, and the subscription list closed soon after it opened. If money conditions remain as easy as they have been of late, it is not unreasonable to expect a rise to 100 in the price as the stock settles down into the hands of permanent investors. It is hardly necessary to refer to the slight tightening of money rates that commonly comes with the end of each December. This recurs with as monotonous regularity as the turkey and plum pudding. The fact remains that money in abundance is available for investment purposes, and the new issue of London and Home Counties 3¼ per cent. stock will make a useful addition to the books of dealers in these securities, considering how limited is the supply at present available.

Central Electricity issues, together with those of other public boards, show hardly any variation in price. A rise of 2 points in London Passenger Transport "C" stock is a further reflection of the satisfaction felt by holders of transport issues with the award made, a fortnight ago, to Tillings.

Ever Ready

The violent fluctuations which have occurred during the last week or two in the price of Every Ready shares have attracted no little attention. From 27s. 6d., the price fell away abruptly to 22s., following the drop quoted here last week in the price of Lissen preference, which came down from a recent 25s. to a somewhat nominal price of 17s. 6d. The falls were explained by reference to competition that has started to undercut the prices charged by the Ever Ready Company for batteries. More is likely to be heard of the matter in the near future, but in response to a good many requests, the Ever Ready directors have replied to certain questions raised

by reason of the fall in the price of the shares, stating that the business of the company continues to be satisfactory; that they are of opinion that the dividend on Lissen 8 per cent. preference will be paid next March; and that the income and investment position of the Ever Ready Trust Company is satisfactory. The effect of this reassuring statement was to bring about a rally in the price of the shares, and Ever Readys rose to 22s. 9d., still leaving them 4s. 6d. lower on the week. Lissen preference, from 16s., recovered to 17s. 3d., and Ever Ready Trust shares, after touching 17s., rose to 18s.

Pye Radio shares have been slightly affected by the weakness of Lissens, because the two companies have a working agreement.

Manufacturing and Equipment

Associated Electrical Industries shares are better at 25s. for the ordinary and 35s. for the preference. It is said that the realisation of a large line of shares which had been on offer from the United States has now been completed, and that, freed from this incubus, the market was better able to respond to the demand for the shares. Possibly some truth may reside in the explanation. Crompton Parkinsons have again forged ahead this month on consideration of the excellent figures disclosed in the report. At 36s., the price shows a florin gain. India Rubber preferred strengthened to 21s. 3d. English Electric preference have come into demand, with a consequent rise to 11s. 3d. Johnson and Phillips eased off to 29s. 6d. British Aluminium reacted to 28s. 9d. Aron Electricity continued to droop; at 68s. 9d. the price is $\frac{1}{16}$ down. Reyrolle at 59s. hold their recently acquired strength. Enfield Cables and Callenders are both $\frac{1}{16}$ easier. Investment has been paying marked attention to Enfield Rolling Mills, and a good many thousand have recently been bought on the basis of 25s. Hall Telephone Accessories at 20s. 6d., and Telephone Rentals at 9s. 6d. are both a few pence lower than they were a week ago. British Power and Light shares at 22s. 9d. are unchanged on the offer of the Corporation to its shareholders of 400,000 6 per cent. preference shares at 28s. 9d. The issue is being made in order to extinguish a bank overdraft and to provide money for the purchase of preference shares in the Electricity Distribution of North Wales and District. The Corporation's preference shares are better at 29s. 6d.

Electricity Supply Shares

After the substantial rises which shares in the London Electricity supply group enjoyed a fortnight ago, and the subsequent slight reaction, prices in the London group have settled down to a general average of about 36s. 3d. At this, the return on the money is £3 17s. 6d. per cent., or, if the accrued dividends are taken into account, nearly 4 per cent. on the money. The latter rate seems modest enough for an investor to receive on account of ordinary shares, but where the latter are gilt-edged, the income is regarded as being not too bad, to use a negative phrase, in the circumstances of the time. North Metropolitan ordinary at 63s. 6d. have given way a shilling. North Eastern ordinary are 1s. 6d. lower at 33s. 6d. Clyde Valley shares reacted to 41s. On the other hand, various pre-ordinary issues have advanced. Electrical Finance 5½ per cent. debenture strengthened to 106, North Eastern 5 per cent. debenture to 110. In the preference group, City of London 8 per cent. seconds at 40s. are up 7½d., Lancashire 6 per cent. preference have gained 6d. at 37s. 6d., and North Eastern sevens the same amount at 35s. 6d.

Cables and Wireless

There is a generally firm tone in the market for communications stocks. Cables and Wireless 5½ per cent. preference at 83½ has gained the fraction. Globe ordinary and preference are both better. The Postmaster-General, by circularising all telephone subscribers with reference to the interchange of Christmas greetings, has given an excellent advertisement reminder that should stimulate overseas traffic, and, there being more money about this Christmas than has been the case for some years past, the amount of seasonable messages should show noticeable increase. Further rises in the preferred and deferred stocks of the Anglo-American Telegraph Company witness the pressure of investment demand. American Telephone and Telegraph stock is a point up at 111½. International Telephone and Telegraphs are a little better at 9½. With many a setback, the business position in the United States seems to be making progress on balance. Greater interest is being shown on this side in the stocks and shares of American and Canadian utility companies. Time will be required to restore sufficient confidence in the mind of the investor for him to buy Latin-American utilities.

Miscellaneous Matters

B.E.T. Electricity Supply Company, Ltd., has acquired a block of investments from the British Electric Traction Company, and placed privately a line of 4 per cent. debenture stock at 100 per cent. The whole of this stock was sold in the market at 102 in less than two days. The deferred stock of the parent company is 10 points down at 915. Some of the foreign traction shares are easier; Brazilian Tractions, sold by Brussels holders, have receded to 10¼. Iron and steel shares show a halting disposition. The rubber markets, both for shares and produce, await a revival of American demand that declines to be hurried.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Dec. 11.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	78/9	—	3 16 2
Brompton Ordinary	1	7	7	36/–	—	3 17 9
Charing Cross Ordinary	1	7	7	36/–	—	3 17 9
Chelsea	1	7	7	36/–	—	3 17 9
City of London	1	7½	7½	38/6	—	3 18 0
Clyde Valley	1	7	7	41/–	–1/–	3 8 4
County of London...	1	10½	10½	57/0	–6d.	3 13 8
Edmundson's 7% Pref.	1	7	7	37/6	—	3 14 9
Elec. Dis. Yorkshire	1	9	9	50/–	–6d.	3 12 0
Elec. Supply Corporation ...	1	11	11	58/9	–⅛	3 14 10
Kensington Ordinary	1	7	7	36/–	—	3 17 9
Lancs Light and Power	1	7	7½	38/6	—	3 18 0
London Electric	1	7	7	37/–	—	3 15 8
Metropolitan	1	10	10	54/–	—	3 14 1
Midland Counties	1	7	7	39/–	—	3 11 10
Mid. Elec. Power	1	8	8	47/6	—	3 7 7
North Eastern Electric Ordinary	1	6	6	33/6	–⅛	3 11 7
Do. 7% Pref.	1	7	7	35/6	+6d.	3 19 0
Northampton	1	10	10	56/3	—	3 11 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary ...	1	10	10	63/6	–1/–	3 3 0
Do. do. 6% Pref.	1	6	6	32/6	—	3 13 10
St. James' and Pall Mall ...	1	7	7½	38/6	—	3 18 0
Scottish Power	1	8	8	42/6	—	3 15 5
South London	1	7	7	36/–	—	3 17 9
Westminster Ordinary	1	7	7	36/6	—	3 16 9
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/6	—	6 19 6
Yorkshire Elec.	1	8	8	48/–	—	3 6 8
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	116	—	4 6 0
Do. 1955–75 ...	„	5	5	118	—	4 4 9
Do. 1951–73 ...	„	4½	4½	110	—	4 1 10
Do. 1963–93 ...	„	—	3½	102	—	3 8 8
London & Home Counties, 1955–75	„	4½	4½	112	—	4 0 4
London Passenger Transport, A...	„	—	4½	123½	—	3 13 0
Do. do. B...	„	—	5	127½	—	3 18 5
Do. do. C...	„	—	3	94	+2	3 3 10
West Midlands Joint Elec. 1948–68	„	—	5	118	—	4 4 9
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	111½	+1	8 1 6
Anglo-Am. Tel. Pref.	Stock	6	6	121½	+½	4 18 9
Do. Def.	„	1½	1½	31½	+1	4 15 3
Cables & Wireless 5½% Pref. ...	„	2¾	2¾	83½	+½	3 5 10
Do. A. 7½% Ord.	„	Nil	Nil	18	+¾	—
Do. B. Ord.	„	Nil	Nil	7	—	—
Globe Tel. and T. Ord.	10	Nil	2½	10½	+⅜	2 7 1
Do. do. Pref.	10	6	6	13⅜	+⅛	4 8 0
Great Northern Tel.	10	20	20	38	—	5 5 3
Marconi-Marine	1	10	7½	33/9	—	4 9 0
Oriental Telephone Ord.	1	12	12	3½	—	*3 18 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	915	–10	—
Do. do. Pref. Ord.	„	8	8	168½	+1	4 15 0
Brazil Traction	100	—	—	10½	–½	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	107	—	4 13 6
Mexico Trams, 5% Bonds ...	—	5	5	19½	—	—
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds...	—	5	5	45	—	—
Victoria Falls Ord.	1	15	20	6¾	+⅛	2 19 2
Yorkshire (West Riding) ...	1	2½	5	25/6	—	3 18 5
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	10	68/9	–⅛	2 18 2
Assoc. Elec. Ord.	1	4	3	25/–	+6d.	2 8 0
Do. Prf.	1	8	8	35/–	+⅛	4 11 5
Babcock & Wilcox	1	9	6	44/9	–1/–	2 13 8
British Aluminium Ord.	1	5	5	28/9	–9d.	2 9 7
British Insulated Ord.	1	15	15	77/6	—	3 17 6
Brush Ord.	Stock	Nil	Nil	38	+½	—
Callender's	1	15	15	3⅛	–⅛	4 10 8
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/–	22½	12½	36/–	+2/–	1 14 10
Do. 8% Pref.	1	8	8	35/–	—	4 11 5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
Electric Construction	1	Nil	Nil	17/6	—	—
Enfield Cable Ord.	1	25	20	4⅛	–⅛	4 3 0
English Electric	1	Nil	Nil	6/3	—	—
Do. do. Pref.	1	Nil	Nil	11/3	+6d.	—
Ever Ready	5/–	35	35	22/9	–4/6	7 13 10
Ferranti Pref.	1	7	7	30/9	—	4 11 7
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	49/6	—	3 4 4
Henley's	1	30	30	6⅜	—	4 8 0
Do. 4½% Pref....	5	4½	4½	5⅛	—	3 18 3
India-Rubber Preferred	1	—	—	1⅛	+⅛	—
Johnson & Phillips	1	5	5	29/6	–6d.	3 7 8
Siemens Ord.	1	6½	4	1	—	4 0
Telegraph Construction	£1	Nil	Nil	1⅛	—⅛	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

4168. "Scanning devices such as mirror-drums for use in television, picture-telegraphy, and the like systems." Electric & Musical Industries, Ltd., and C. O. Browne. February 10th, 1933. (419523.)

4169. "Television and the like systems." Electric & Musical Industries, Ltd., C. O. Browne and J. Hardwick. February 10th, 1933. (419441.)

4591. "Miners' or the like safety lamps." E. A. Hailwood. February 15th, 1933. (419594.)

6315. "Electric signs." Strand & Interchangeable Signs. Ltd., and F. A. Andrews. March 2nd, 1933. (419442.)

10101. "Parallel generation of electric discharge tube invertors with dynamo-electric alternating-current generators." International General Electric Co., Inc. April 4th, 1932. (419665.)

11264. "Braun tube for oscillographic and television purposes." Radioakt-Ges. D. S. Loewe and Dr. K. Schlesinger. April 22nd, 1932. (419727.)

12895. "Radio transformers." J. T. Nichols. May 2nd, 1933. (419449.)

13197. "Television." Electric & Musical Industries, Ltd., and J. D. McGee. May 5th, 1933. (419452.)

13493. "Electrical communication cables." Telegraph Construction & Maintenance Co., Ltd., and E. W. Smith. May 9th, 1933. (419525.)

13504. "Type-printing telegraph systems with means for eliminating interference." A. Bakker and H. C. A. Van Duuren. May 9th, 1933. (419526.)

13616. "Electrically operated calculating apparatus." Siemens Bros. & Co., Ltd., A. A. Southam and J. H. Broome. May 10th, 1933. (419600.)

13850. "Lighting fittings." G. Campbell and Benjamin Electric, Ltd. May 12th, 1933. (419602.)

14003. "Electric storage batteries." J. Lucas, Ltd., and G. V. Lateulere. May 13th, 1933. (419460.)

14108. "Thermionic valves and valve circuits." E. Y. Robinson and Associated Electrical Industries, Ltd. May 15th, 1933. (419731.)

14212. "Wireless direction-finding systems." C. F. Sutton. May 17th, 1933. (419676.)

14253. "Electrical testing." C. A. Parsons & Co., Ltd., J. Rosen, W. D. Horsley and V. Easton. May 17th, 1933. (419732.)

14282. "Road contact devices for road-traffic signalling apparatus." W. H. Scott. May 17th, 1933. (419533.)

14299. "Control of electrically propelled vehicles." British Thomson-Houston Co., Ltd., and J. H. Cansdale. May 17th, 1933. (419734.)

14300. "Electric arc lamps for projection lanterns." British Thomson-Houston Co., Ltd., and H. Trencham. May 17th, 1933. (419735.)

14434. "Electric control systems for well-drilling plant." British Thomson-Houston Co., Ltd. May 18th, 1932. (419609.)

14468. "Control of volume in wireless receiving apparatus or the like." Paragon Rubber Manufacturing Co., Ltd., and H. C. Atkins. May 18th, 1933. (419749.)

14526. "Electrostatic precipitating plant." Sturtevant Engineering Co., Ltd., and H. W. Wagner. May 19th, 1933. (419610.)

14561. "Traffic-control signals." Automatic Electric Co., Ltd., and D. Wright. May 19th, 1933. (419751.)

14887. "Electric lampholders of the bayonet type." General Electric Co., Ltd., and F. W. Payne. May 23rd, 1933. (419612.)

14949. "Electric liquid level indicator with automatic warning device." J. Leebury-Smith. May 24th, 1933. (419677.)

15016. "Loud speakers." G. Campbell and Magnavox (Great Britain), Ltd. May 24th, 1933. (419755.)

15461. "Electric motor control systems." English Electric Co., Ltd., C. J. Caldbeck and J. Martin. May 29th, 1933. (419614.)

15483. "Electric valve circuits." British Thomson-Houston Co., Ltd. May 27th, 1932. (419757.)

16711. "Junction, inspection, and other like boxes for electricity distributing systems." F. C. Blackwell & Co., Ltd., and F. Firth. June 12th, 1933. (419758.)

18497. "Cooling of dynamo-electric machines." F. W. W. Highfield and Highfield Electrical Co., Ltd. June 29th, 1933. (419548.)

19066. "Electromotors, such as those used to drive apparatus in telephone and like systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. July 5th, 1933. (419762.)

19322. "Method and apparatus for electro-deposition." Anaconda Copper Mining Co. July 13th, 1932. (419764.)

19945. "Switch mechanism particularly for prepayment electricity meters." F. Holden and Measurement, Ltd. July 14th, 1933. (419765.)

21075. "Starting devices for synchronous electric motors." P. O. Dorer, H. F. Landstad and S. Smith & Sons (Motor Accessories), Ltd. July 26th, 1933. (419767.)

22183. "Systems of electric motor control." British Thomson-Houston Co., Ltd. August 6th, 1932. (419769.)

22422. "Electrical condensers." Dubilier Condenser Co. (1925), Ltd. (J. Katzman). August 11th, 1933. (419622.)

22527. "Mirror drums for television apparatus." Wilkins & Wright, Ltd., and J. H. Hewitt. August 12th, 1933. (419623.)

23471. "Electric vibrators, more particularly vibrators for sound-recording." Radio Corporation of America. September 16th, 1932. (419683.)

26185. "Gas-filled electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 7th, 1932. (419627.)

28975. "Automatically reclosing circuit-breaker systems for use on electric railways." British Thomson-Houston Co., Ltd. October 19th, 1932. (419630.)

33353. "Electric batteries." Soc. Anon. Le Carbone. December 5th, 1932. (419485.)

33935. "Electric relays." Brush Electrical Engineering Co., Ltd., and J. S. Messent. December 2nd, 1933. (419564.)

34480. "Incandescent electric lamps." F. G. Strong. December 7th, 1933. (419631.)

34837. "Tachometers or speed indicators of the chronometric type, with remote electric control." Etablissements E. Jaeger. December 14th, 1932. (419691.)

34950. "Electric cables or conductors." Siemens and Halske Akt.-Ges. July 11th, 1933. (419488.)

1934

159. "Electromagnetically operated tuned or resonous relay or like apparatus." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz." January 13th, 1933. (419634.)

1333. "Anodic coating of zinc base metals." H. G. C. Fairweather (New Jersey Zinc Co.). January 13th, 1934. (419781.)

2706. "Electric radiant heat element." J. Isbister. February 6th, 1933. (419696.)

3548. "Wireless receiving apparatus." Marconi's Wireless Telegraph Co., Ltd. February 2nd, 1933. (419783.)

3620. "Thermionic amplifiers." Hazeltine Corporation. March 10th, 1933. (419784.)

4483. "Spring toggle devices more particularly for imparting a quick make-and-break action to electric switches." English Electric Co., Ltd., A. M. Pooley and A. A. Heath. February 10th, 1934. (419575.)

6480. "Rectifiers of the mercury-arc type." Forges et Ateliers de Constructions Electriques de Jeumont. May 25th, 1932. (Divided application on 14287/33.) (419789.)

6691. "Electric vacuum cleaner." O. Grave. March 2nd, 1934. (419702.)

6764. "Loud-speaker units." W. J. Tennant (Rola Co.). March 2nd, 1934. (419639.)

9182. "Electrically controlled screw-tapping machines." R. Herrmann and E. Herrmann. May 8th, 1933. (419705.)

11138. "Wireless sets." R. Bosch Akt.-Ges. and R. Linder. April 13th, 1934. (419710.)

11317. "Apparatus for the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Siemens-Lurgi-Cottrell-Elektrofilter Ges. für Forschung und Patentverwertung). April 14th, 1934. (419647.)

14017. "Control of electrically ignited gas burners." Gawa Patent-Verwaltungs-Akt.-Ges. May 9th, 1933. (419715.)

15860. "Electric switches for motor vehicles." L. G. Kraus. May 26th, 1933. (419718.)

15861. "Street-lighting apparatus." Holophane, Ltd. (Soc. Anon Française Holophane). May 28th, 1934. (419653.)

17001. "Superheterodyne radio receivers and the like." Hazeltine Corporation. November 16th, 1933. (419795.)

17679. "Road-traffic signalling means." J. F. Southgate and H. M. Dobson. June 14th, 1934. (419655.)

21906. "Indirectly heated cathodes." British Thomson-Houston Co., Ltd. July 29th, 1933. (419659.)

23449. "Electrical connections." British Thomson-Houston Co., Ltd. August 25th, 1933. (419724.)

25490. "Electric cable systems." Soc. Italiana Pirelli. December 2nd, 1933. (Addition to 33940/33.) (Divided application on 33940/33.) (419592.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 5th:—

Silver Ghost. No. 553506. Class 8. Illuminated signs for road direction.—W. G. Bailey, 48a, Philbeach Gardens, S.W.5.

Transatlantic (lettering and design). No. 553480. Class 8. Sound reproducing and recording apparatus, radio-telephonic apparatus and radio-telephonic apparatus in combination with gramophones, and parts thereof.—British Belmont Radio, Ltd., Balfour House, 119-125, Finsbury Pavement, E.C.2.

Lassophone Rental Services. No. 555012. Class 8. Instruments and apparatus for use in radio-telephony and telegraphy, television, etc., and wireless telephonic and telegraphic apparatus in combination with gramophones.—H. H. Lassman, trading as the East Ham Wireless Supplies, 427-429, Barking Road. East Ham, E.6.

I.E.E. East Midland Dinner

At the annual dinner of the East Midland Sub-Centre of the Institution of Electrical Engineers at Nottingham on December 7th, at which Mr. J. H. R. Nixon, chairman of the Centre, presided, Ald. E. Huntsman (chairman, Nottingham Electricity Committee) proposed the toast of "The Institution of Electrical Engineers" in a very witty speech. In his reply the President of the Institution, Prof. W. M. Thornton, recalled that he visited Nottingham twenty-five years ago to discuss the use of electricity in mines. There was then a remarkable outburst of activity in the electrical world following upon a terrible explosion at a Durham colliery. That explosion altered the whole course of his life. He vowed that he would leave the work which he was doing—dielectrics and insulation—and devote all his efforts to the solving of problems of the ignition of coal dust and gases in mines. He had worked at that for twenty years. Electricity in mines was now as safe as it could humanly be made, and the Institution could claim a fair share of the credit. It could now be said that English coal mines were the safest in the world. The toast of "Electrical Progress" was submitted by Mr. T. P. Wilmshurst, and Mr. Ashbridge, chief engineer of the B.B.C., responded. The toast of "The Guests" was proposed by Mr. J. H. R. Nixon, chairman of the Centre, and acknowledged by Coun. J. Minto, chairman, Leicester Electricity Committee.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Houses (29), Laneside Estate; borough engineer.

Aldershot.—Permanent shopping market, electrical work; Mr. Aylwin, of P. F. E. Wells & Partners, architect, The Arcade.

Axbridge.—Extensions, including ward block, Isolation Hospital, for the Joint Hospital Committee; A. J. Pictor, architect, Abbey Chambers, York Street, Bath.

Ayrshire.—Extensions, Higher Grade School, Dalmellington, electrical work, for County E.C.; W. Reid, county architect, Ayr.

Bangor.—Houses (84), Ffriddoedd Estate; B. Price-Davies, city architect, Town Hall.

Barking.—Ward block, maternity hospital (£11,280), by direct labour; borough engineer.

Barrhead.—Houses (200), Crossmill site; A. W. Bryson, burgh surveyor, Municipal Buildings.

Barrow-in-Furness.—Houses, Beacon Hill Estate; J. Whittaker. Houses (29), Davy Street and Devon Street; Simon Newman.

Berwick-on-Tweed.—New telephone exchange for the Berwick Post Office; P. Whittle & Sons, builders.

Bilston.—Houses (108), Bradley Lodge Estate; M. A. Boswell, builder, Wolverhampton.

Blackpool.—Houses (54), Newhouse Road; H. Radcliffe. Houses (53), North Drive; R. & H. Fletcher, Ltd.

Bristol.—Houses (118), Knowle and Bedminster Estate (£34,165); John Knox (Bristol), Ltd. Junior instruction centres (£22,000); city engineer.

Burnley.—Houses (464), Hargher Clough Estate; borough engineer.

Cardiff.—Houses (100), clearance scheme; city engineer.

Chadderton (LANCS).—Houses (40), Henley Street; U.D.C. surveyor.

Chanctonbury (SUSSEX).—Houses (178); R.D.C. surveyor.

Cheadle (CHESHIRE).—Houses (40), "Daylesford Estate"; Schools Hill; J. L. Edwards, architect, 1, Ridgefield, Manchester.

Chesham.—Houses (30), Pond Park; Saunders & Son, builders.

Cheshunt.—Houses (38); U.D.C. surveyor.

Chesterfield.—Houses (200), Derby Road, Wingerworth; C. L. Hoole, builder, Bacon Lane. Houses (27), Staveley; R.D.C. surveyor. Central premises for the Joint Water Board (£15,000); A. Mason, builder, Mansfield.

Colchester.—Houses, Old Heath Road; S. E. Baillie. Library, Culver Street, and school, Sheepen Farm Estate; borough engineer.

Dartford.—Extension to Bow Arrow Hospital (£50,000); governors.

Dudley.—Houses (400), Bunn's Lane; borough engineer. Factory, West Street, for the Co-operative Society, Ltd.

Dumfries.—Extensions to Dumfries and Galloway Royal Infirmary (£70,000); medical superintendent.

Durham.—Houses (100), Sherburn Road; J. W. Green, city surveyor.

Falkirk.—Houses (114) (£30,000); burgh surveyor.

Gateshead-on-Tyne.—Public baths at the junction of Alexandra Road and Shipcote Lane (£38,544); F. R. Patterson, architect, Town Hall.

Gillingham (KENT).—Town hall and municipal offices (£85,000); borough surveyor.

Glasgow.—Houses (640); architect, housing department. Church, Helevale Street, for the Church of Scotland; Hutton & Taylor, 5, India Street. Needlework factory, at Ruchill Street, for T. F. Beckett & Co. (Fairstych), Ltd., 20, Renfrew Street; Kelvin Construction Co., Ltd., Lochburn Road, Maryhill. News reel cinema, Central Railway Station; Alistair G. MacDonald, architect. Shops, Craigton Road, Govan, for Galbraiths Stores, Ltd., 53, Back Sneddon Street, Paisley; Cook & Hamilton, architects, 7, Gilmour Street, Paisley. Additions to chemical factory for the Scottish Co-operative Wholesale Society; the manager.

Gloucestershire.—Grammar school, Chipping Sodbury (£22,175), for County E.C.; director of education, Gloucester.

Godalming.—Houses (32), Ockford Ridge; borough surveyor.

Gosforth (NORTHUMBERLAND).—Houses (100); C. Wyld, surveyor, Council Offices, High Street.

Grangemouth.—New Municipal Buildings; burgh surveyor.

Greenford.—Factory buildings, for Joseph Nathan & Co., Ltd. (£100,000); Wallis, Gilbert, & Partners, London, S.W.1.

Hampshire.—Staff houses (30), Park Trewett Mental Hospital (£14,140), for C.C.; county architect, The Castle, Winchester.

Heaton Chapel (CHESHIRE).—Factory, for the Fairey Aviation Co., Hayes, Middlesex.

Henley-on-Thames.—Cinema, Bell Street, for Consolidated Cinemas, Ltd.

Hereford.—Houses (104), Great Broad Leys Estate; Hallwoods, builders, Manchester.

Huddersfield.—Extensions to works for William Whiteley & Sons.

Kent.—Library, Trinity Road, Sheerness, for County E.C.; county architect, Maidstone.

Ketley (WELLINGTON, SHROPSHIRE).—Houses (64), for Timmins & Davies, Wolverhampton.

Lanarkshire.—Primary school, Montrose Avenue, Carmyle, for C.C.; architect, County Council, Hamilton.

Leeds.—Houses, Osmondthorpe Road, Otley Old Road, Oakwood Lane and Foundry Lane; city engineer. Houses, Warrells Street; A. Appleyard & Son. News reel cinema and rebuilding, Wellington Station; L.M. & S. Railway Co., and borough engineer. School, King Lane, Nursery Lane, Moortown Estate; city architect.

Leek.—Employment exchange; H.M. Office of Works, London, S.W.1.

London.—(HACKNEY).—Nurses' home, Hackney Hospital (£91,500); L.C.C. Hospitals and Medical Services Committee. (KENNINGTON).—School (£33,744); L.C.C. architect. (WESTMINSTER).—Rebuilding Buckingham Gate School (£27,446); L.C.C. architect. (WHITECHAPEL).—Additions to St. Peter's School; School governors.

Maidstone.—Block of flats, Ringlestone Estate; borough surveyor. Houses (80), London Road Estate (electrical work); Cox Bros., builders.

Maldens & Coombe.—Town hall and extensions to Municipal offices; U.D.C. surveyor.

Market Harborough.—Houses (52), Walcot Road; Thos. Barker & Sons, Loughborough.

Middlesbrough.—Houses (86), near Tollesby Road; Archibald & Archibald, architects, 26, Albert Road. Alterations, Marton Grove Council School, for E.C.; P. Haswell, architect, Woodlands Road.

Motherwell.—Houses (120), Wishaw (£36,000); burgh surveyor.

Newbiggin (NORTHUMBERLAND).—R.C. Church, Front Street; Rev. Father Connelly, St. Aidan's Church, Ashington.

Newcastle-on-Tyne.—Houses (40), Cundercum Park Estate; G. C. Haddon, builder, Huddlestone Road. Town Hall, Great North Road (£300,000); city architect.

North Riding.—Extensions to the Claypenny Colony for Mental Defectives, Easingwold, for C.C.

Northwich.—Houses (50), housing site; F. E. James, U.D.C. surveyor.

Nottingham.—Swimming bath, Carrington; city surveyor.

Plymouth.—Houses, Desborough Road, &c.; I. Cohen. Girls' school, Devonport (£42,000); city architect. Extensions to Royal Western Counties Institution; city engineer.

Ramsgate.—Undercliff promenade and swimming bath (£60,000); borough surveyor.

Reading.—Houses (68), "White House," Basingstoke Road; Gee, Walker & Slater, Ltd. Hall, clinic and dispensary, Whitley Estate (£9,250), and improvement to sewage disposal works, Manor Farm (£80,000); town clerk.

Richmond (YORKS).—Houses (240), Hipswell; F. Blenkinsopp, R.D.C. surveyor.

Rugby.—Houses (48); borough surveyor.

Rushden.—Houses (26); J. W. Lloyd, surveyor, Council Buildings.

St. Albans.—Houses (54); J. T. Bushell & Sons, builders.

Salford.—Houses (40), Longworth Road, Pendleton; A. Castle & Son, builders, 300, Great Cheetham Street, Broughton.

Scarborough.—Houses, Sandybed Garden Estate; F. W. Plaxton, builder, Marlborough Street. Extensions to library; borough engineer.

Seaham Harbour.—R.C. School for the Roman Catholic authorities.

Southport.—Houses (62), Stafford Road; William Morris Bros., Ltd., 3, Hart Street, Bridge, St. Lukes.

Stockbridge.—Houses (150), riverside site; H. J. Holden, Cottingley Bar.

Stretford.—Houses (54), Barkway Road; Freeman, Evans & Co. Houses (35), Basford Road, Brooks Road, &c.; Smith & Allcock. Library, conveniences, &c., Firswood, and additional accommodation to school clinic, &c.; borough engineer.

Sunderland.—Homes (20), Ford Estate, for Haig Homes, 6, Duke Street, St. James's Square, London, S.W.1.

Sutton Coldfield.—Houses (40), Clarence Road; F. A. Coleman. Houses (20), Rough Road; G. E. Clarke. X-ray block to Cottage Hospital; Hospital governors.

Swindon.—Municipal Offices, Princes Street; borough engineer.

Torquay.—Cinema, St. Marychurch Road; H. Lloyd & Son.

Tottenham.—Factory, for H. Lazarus (Cabinet Works), Ltd., London, E.5 (£100,000).

Tynemouth.—Houses (424), Ridges Estate; J. L. Beckett, borough engineer, North Shields.

Wallsend-on-Tyne.—Houses, High Howdon Estate; A. Lisle & Sons, builders, Whitley Bay. Houses and shops, Coast Road; C. W. Leech.

Wandsworth.—Administrative block, Bolingbroke Hospital (£70,000); secretary. Extensions to Technical Institute (£55,880); L.C.C. architect.

Warminster.—Cinema, Weymouth Road, for the Plaza Cinemas Associated, Ltd. (Warminster).

Warrington.—School, Latchford, for Governors of the Grammar School; secretary.

West Bromwich.—School, Hamstead; borough engineer.

Wigan.—Grammar school, for Borough E.C.; director of education.

Wigston.—Houses (42), Oadby Road, Wiston Road, Leicester Road, and Marston Avenue; Housing Committee.

Willington.—Houses (60); Hays & Gray, U.D.C. architects, Central Chambers, Wingate, Co. Durham.

Wimbledon.—Reconstruction of Haydons Road Bridge (£19,650); borough engineer and Southern Railway Co.

Wishaw.—Houses (120), Greenhead Road (£35,000); Lewis Costley, burgh surveyor, Town Hall, Motherwell.

Woolwich.—Extensions to the Polytechnic (£24,850); Polytechnic governors.

Workington.—Houses, Newlands Estate; James Leslie & Sons. Houses (48) for aged persons, Salterbeck Estate; borough engineer.

Worthing.—Houses (32), Adversane Road; E. W. Owen, on behalf of G. Baker & Son. Houses (14), Brook Close and Southfarm Road; H. M. Potter. Flats, Brighton Road and Brougham Road; A. T. W. Goldsmith, on behalf of C. H. Jeffery. Shops, Ham Road; P. J. Page. Extensions to Swandean Hospital; M. R. Fletcher, architect.